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National Cooperative Dairy Herd Improvement Program
RECORD BOOK
A plan for every size herd
STANDARD DHIA OWNER SAMPLER WEIGH-A-DAY-A-MONTH
AGRICULTURAL RESEARCH SERVICE U. S. DEPARTMENT OF AGRICULTURE

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Dairy-Herd-Improvement Letter
ARS-44-173
(Vol. 42, No. 1)

January-February 1966

1,749,752 LACTATION RECORDS REPORTED IN 1965

The number of lactation records reported to the USDA for genetic appraisal and research was 1,749,752 in 1965, 311.793 more than in 1964. Of these, 54.2 percent were re-
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cords reported since 1956 is shown below:

NOTICE
AT LEAST ONE OF THE EDGES OF THIS MAGAZINE HAS BEEN LEFT UNTRIMMED, BECAUSE OF AN EXTREMELY NARROW MARGIN.
HERTZBERG-NEW METHOD, INC.

Year	DHIA cows enrolled (Number)	Lactation records reported to USDA (Number)	Pct. of DHIA cows represented by records reported (Percent)
1956	1,406,306	658,086	47
1960	1,746,752	886,495	51
1964	2,010,144	1,437,959	72
1965	2,087,581	1,749,752	84

CONTINUED INCREASE IN CENTRAL-PROCESSING OF LACTATION RECORDS

In 1965, 96.8 percent of the lactation records reported to USDA were centrally processed. The benefits to be derived from centrally processed DHIA herd books and records have been thoroughly demonstrated during the last 10 years. It is hoped

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Since 1956, the number of cows enrolled in DHIA has increased 48 percent, while the number of lactation records [illegible] to the USDA has increased 166 percent. As a result, [illegible] percent of cows on test having reported records has increased from 47 to 84 percent since 1956. This more complete reporting is attributed largely to the continued development of central processing of DHIA records. A summary of the records reported since 1956 is shown below:

Year	DHIA cows enrolled (Number)	Lactation records reported to USDA (Number)	Pct. of DHIA cows represented by records reported (Percent)
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Issued March 1966

that dairymen who have not converted to the improved system will do so soon.

18,619 SUMMARIES OF SIRES IN 1965

In the four quarterly sire evaluations in 1965, 18,619 summaries were made of sires in DHIA. (Individual sire records sent to the States are given by breed in table 2.) Seventy-five percent of the sire summaries represented sires in natural service, averaging 13.9 daughter-herdmate pairs per summary and a total of 194,489 daughter-records. The remaining 25 percent included summaries for sires used in artificial insemination and 1,180,593 daughter-records averaging 253 daughter-herdmate pairs per summary.

During 1965, a total of 61,538 copies of individual sire records were made available to the cooperating States.

16,142 DHIA COWS INDEXED IN 1965

A total of 16,142 DHIA cows, representing the top 2 percent of registered progeny of bulls summarized in 1965, were indexed in the two evaluations performed.

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TABLE 1.--Production records reported to the USDA for quarterly evaluations in 1965 [1]

State	DHIA cows on test 1-1-65	1965 production records					1964 production records	
		Hand recorded (718 cards)	Punched (1095 cards) 2/	Magnetic tape	Total			
	Number	Number	Number	Number	Number	Percent 3/	Number	Percent 3/
Ala--------	26,510	---	25,742	---	25,742	97.1	22,098	98.1
Alaska-----	385	36	11	178	225	58.4	132	25.3
Ariz-------	20,206	---	3,631	---	3,631	18.0	3,878	19.1
Ark--------	3,149	---	127	3,934	4,061	129.0	3,826	106.1
Calif------	350,987	4,175	55,248	147	59,570	17.0	17,048	5.4
Colo-------	14,414	---	5,569	---	5,569	38.6	5,803	44.7
Conn-------	22,687	1,921	192	20,903	23,016	101.5	14,788	65.7
Del--------	4,234	---	124	4,551	4,675	110.4	4,643	125.4
Fla--------	18,086	792	13,122	---	13,914	76.9	15,548	83.0
Ga---------	28,493	442	25,147	---	25,589	89.8	18,659	69.7
Hawaii-----	1,970	---	49	284	333	16.9	162	5.2
Idaho------	27,077	2,496	2,531	8,575	13,602	50.2	10,505	36.6
Ill--------	64,256	314	56,808	---	57,122	88.9	61,540	96.2
Ind--------	43,381	---	38,113	17,464	55,577	128.1	46,136	114.5
Iowa-------	61,732	797	22	64,487	65,306	105.8	59,454	103.5
Kans-------	31,643	1,314	62	33,730	35,106	110.9	29,453	89.0
Ky---------	20,920	1,580	18,299	---	19,879	95.0	16,438	74.7
La---------	4,882	330	3,893	---	4,223	86.5	3,895	73.9
Maine------	19,958	1,185	58	17,912	19,155	96.0	18,400	95.2
Md---------	43,959	3,808	312	33,299	37,419	85.1	42,089	92.8
Mass-------	22,168	975	59	21,643	22,677	102.3	22,466	100.9
Mich-------	90,722	---	114,115	---	114,115	125.8	82,537	95.7
Minn-------	126,440	11,145	93,306	---	104,451	82.6	94,050	74.7
Miss-------	13,402	55	13,014	---	13,069	97.5	8,745	77.2
Mo---------	25,130	1,633	59	17,144	18,836	75.0	12,990	53.4
Mont-------	3,946	850	1,095	---	1,945	49.3	1,511	37.3
Nebr-------	14,400	66	216	14,803	15,085	104.8	12,133	91.5
Nev--------	3,849	---	1,915	---	1,915	49.8	1,968	51.1
N. H-------	11,866	---	57	12,991	13,048	110.0	13,951	107.9
N. J-------	30,124	1,904	594	22,753	25,251	83.8	18,804	62.7
N. Mex-----	4,282	---	2,325	---	2,325	54.3	2,025	37.8
N. Y-------	173,363	---	8	186,588	186,596	107.6	179,765	107.3
N. C-------	44,283	---	46,185	---	46,185	104.3	46,747	108.9
N. Dak-----	6,015	420	---	6,184	6,604	110.0	6,313	95.5
Ohio-------	89,598	71	77,513	33,479	111,063	124.0	75,655	93.9
Okla-------	11,250	---	---	11,472	11,472	102.0	9,133	86.2
Oreg-------	27,215	4,176	1,197	10,681	16,054	59.0	19,576	71.9
Pa---------	175,423	---	937	210,191	211,128	120.4	102,759	59.5
P. R-------	4,575	---	---	---	---	---	---	---
R. I-------	2,276	---	25	2,144	2,169	95.3	6,760	268.5
S. C-------	21,350	---	21,646	---	21,646	101.4	21,634	108.9
S. Dak-----	6,742	---	---	7,553	7,553	112.0	7,109	103.4
Tenn-------	26,809	---	24,810	---	24,810	92.5	14,947	58.6
Tex--------	27,751	837	22,482	---	23,319	84.0	20,172	72.6
Utah-------	19,056	---	15,099	---	15,099	79.2	16,428	90.1
Vt---------	47,721	5,344	58	30,685	36,087	75.6	33,790	71.4
Va---------	61,214	1,764	57,301	---	59,065	96.5	57,126	93.0
Wash-------	54,870	7,720	1,790	20,775	30,285	55.2	25,592	50.4
W. Va------	6,186	714	---	4,775	5,489	88.7	5,815	59.8
Wis--------	125,446	---	133	128,255	128,388	102.3	122,533	103.8
Wyo--------	1,180	---	309	---	309	26.2	430	33.2
U. S-------	2,087,581	56,864	745,308	947,580	1,749,752	83.8	1,437,959	71.5

1/ Includes only records reported in time for use in the quarterly sire evaluations in 1965.
2/ Includes lactation records from the American Guernsey Cattle Club.
3/ Records are expressed as percent of cows enrolled in DHIA. Percentages vary by State and may exceed 100 percent depending upon reporting and processing procedures in December and January of each year and year to year changes in reporting procedures.

TABLE 2.--Number of sire records summarized in 1965, by States, by breed

State	Ayrshire	Guernsey	Holstein	Jersey	Brown Swiss	Shorthorn	Red Dane	Other	Red Poll	Total
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
Maine	57	158	493	141	27	8	--	-	-	884
New Hampshire	111	152	546	145	45	9	--	-	-	1,008
Vermont	107	195	985	346	85	3	--	-	-	1,721
Massachusetts	138	258	839	206	88	5	--	-	-	1,534
Rhode Island	57	79	300	43	--	--	--	-	-	479
Connecticut	103	364	847	150	76	1	--	-	-	1,541
New York	234	495	2,589	391	152	8	4	-	-	3,873
New Jersey	29	312	910	141	104	1	--	-	-	1,497
Pennsylvania	188	862	2,333	319	133	21	--	1	-	3,857
Ohio	131	424	1,527	599	219	13	--	-	1	2,731
Indiana	55	447	1,026	220	141	23	3	2	-	1,917
Illinois	95	465	1,385	204	202	24	--	-	1	2,376
Michigan	62	348	1,815	235	118	21	12	-	-	2,611
Wisconsin	69	640	2,416	235	234	37	--	-	2	3,633
Minnesota	129	334	1,518	217	157	48	--	-	-	2,403
Iowa	108	303	1,487	286	205	65	--	-	2	2,456
Missouri	---	206	640	180	41	24	--	-	-	1,091
North Dakota	3	48	305	12	51	6	--	-	-	425
South Dakota	53	33	462	35	55	--	--	-	-	638
Nebraska	17	178	610	73	89	29	--	-	-	996
Kansas	86	169	772	121	95	20	--	-	-	1,263
Delaware	30	83	358	36	20	--	--	-	-	527
Maryland	88	361	1,139	126	108	11	--	-	-	1,833
Virginia	74	400	1,068	143	78	4	--	-	-	1,767
West Virginia	46	67	428	83	6	--	--	-	-	630
North Carolina	49	286	816	224	52	--	--	-	-	1,427
South Carolina	17	307	495	205	59	--	--	-	-	1,083
Georgia	54	127	597	151	62	--	--	-	-	991
Florida	25	291	307	219	33	--	--	-	-	875
Kentucky	13	125	652	168	59	--	--	-	-	1,017
Tennessee	59	256	464	287	80	14	--	-	-	1,160
Alabama	30	143	337	187	32	2	--	-	-	731
Mississippi	51	219	185	193	37	--	--	-	-	685
Arkansas	7	83	264	47	12	15	--	-	-	428
Louisiana	6	186	182	89	17	--	--	-	-	480
Oklahoma	48	132	434	91	29	27	--	-	-	761
Texas	44	147	648	287	62	1	--	-	-	1,189
Montana	3	22	130	21	22	2	--	-	-	200
Idaho	13	146	522	150	28	5	--	-	-	864
Wyoming	---	10	80	---	6	--	--	-	-	96
Colorado	16	130	465	59	57	3	--	-	-	730
New Mexico	---	95	197	51	--	--	--	-	-	343
Arizona	2	136	316	45	5	--	--	-	-	504
Utah	15	85	503	77	4	--	--	-	-	684
Nevada	---	8	70	87	6	--	--	-	-	171
Washington	56	249	596	168	34	10	--	-	-	1,113
Oregon	17	192	353	223	39	9	--	-	-	833
California	33	179	929	150	76	--	--	-	-	1,367
Puerto Rico	---	---	36	---	--	--	--	-	-	36
Hawaii	---	---	29	---	--	--	--	-	-	29
Alaska	---	---	12	---	38	--	--	-	-	50
Total individual sire records sent to States										61,538
Total sires summarized	667	3,389	11,245	2,326	765	206	12	3	6	18,619

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National Cooperative Dairy Herd Improvement Program
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AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

ARS-44-175
(Vol. 42, No. 2)

Dairy-Herd-Improvement Letter

March 1966

The National Cooperative Dairy Herd Improvement Program is a composite of the Standard (including DHIR), Owner-Sampler, and Weigh-a-Day-a-Month recordkeeping plans. On January 1, 1966, the Program included 66,298 herds consisting of 2,955,387 cows on test, which is 19.1 percent of the nation's dairy cow population. These figures represent an increase of 0.7 percent of cows on test and a net decrease of 1,610 herds and 7,170 cows in the Program from the year before.

Each of the 50 States and Puerto Rico are represented in the total program that includes 1,418 associations and 2,378 supervisors. The participation reports for the combined program and for the Standard, Owner-Sampler, and Weigh-a-Day-a-Month plans are shown in tables 1, 3, 4, and 5, respectively.

On January 1, 1966, there were 1,196 fewer herds and 28,989 fewer cows on Standard test than the year before. Average herd size was 52.9 cows. The percentage of fat test has slightly but steadily declined at an average rate of 0.013 percent per year since 1950. Herd size and the percentage of fat decline agree closely with the estimates for all U.S. dairy cows.

On January 1, 1966, 345 fewer herds, but 21,432 more cows, were on the Owner-Sampler test than in the previous year. Average herd size was 32 cows. Wisconsin had 43.7 percent of the Owner-Sampler enrollment. The Weigh-a-Day-a-Month plan had 1,160 herds consisting of 56,957 cows. Average herd size for this plan was 49.1 cows.

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Issued April 1966

Central data processing at State and regional DHIA centers continues to advance. Central processing of Standard plan records (including DHIR) has reached 100 percent in 32 States. In all States the records of an average of 92.3 percent of the herds and 82.8 percent of the cows are now centrally processed. The corresponding values for records of the three plans combined are 83.8 and 78.8 percent, respectively.

Table 7 is a 10-year summary of the production of DHIA and all U.S. dairy cows. The table shows that the proportion of cows participating in the total DHIA program increased from 9.3 percent in 1956 to 19.1 percent in 1965.

A list of 511 counties having 25 percent or more of their dairy cows on one or more of the recordkeeping plans is shown in table 8.

TABLE 1.--The National Cooperative Dairy Herd Improvement Program
(January 1, 1966)

tate	Counties	Asso-ciations	Super-visors	Standard		Owner-Sampler		Weigh-a-Day-a-Month		Total		Milk cows in U.S.	
				Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Total 1/	In all plans 2/
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Thousands	Percent
la------	51	22	23	313	28,917	14	769	24	1,477	351	31,163	194	16.1
laska---	2	1	2	5	196	4	135	-	-	9	331	2	16.6
riz-----	7	4	12	90	15,956	49	8,852	-	-	139	24,808	51	48.6
rk------	29	13	13	78	3,437	41	1,640	12	360	131	5,437	162	3.4
alif----	43	30	120	1,870	346,141	209	21,912	-	-	2,079	368,053	783	47.0
olo-----	16	15	21	221	15,526	18	953	-	-	239	16,479	106	15.5
onn-----	8	8	24	420	22,664	91	4,825	-	-	511	27,489	72	38.2
el------	3	3	5	97	4,744	12	313	3	56	112	5,113	22	23.2
la------	29	10	11	116	19,018	5	1,442	17	4,704	138	25,164	178	14.1
a-------	95	31	34	394	29,550	3	231	54	5,788	451	35,569	170	20.9
awaii---	3	1	1	13	2,300	-	-	3	132	16	2,432	15	16.2
daho----	27	37	36	559	24,983	15	387	-	-	574	25,370	178	14.3
ll------	82	57	87	1,508	61,102	417	13,888	258	7,577	2,183	82,567	447	18.5
nd------	81	60	80	1,176	46,228	295	10,307	-	-	1,471	56,535	363	15.6
owa-----	96	71	97	1,758	59,640	1,580	39,045	12	250	3,350	98,935	734	13.5
ans-----	80	54	57	782	33,751	113	3,605	10	300	905	37,656	268	14.1
y-------	80	40	47	520	22,000	42	1,557	56	1,845	618	25,402	431	5.9
a-------	35	23	21	71	5,929	14	1,113	165	10,467	250	17,509	203	8.6
aine----	14	14	28	415	18,108	99	3,766	5	200	519	22,074	82	26.9
d-------	20	36	35	789	44,896	87	3,944	-	-	876	48,840	203	24.1
ass-----	11	10	23	455	20,768	81	2,668	-	-	536	23,436	79	29.7
ich-----	77	76	106	1,956	85,234	1,729	55,704	-	-	3,685	140,938	604	23.3
inn-----	85	87	209	3,774	124,103	2,277	60,649	-	-	6,051	184,752	1,231	15.0
iss-----	42	17	22	232	17,237	2	108	75	3,000	309	20,345	268	7.6
o-------	83	45	42	433	19,472	58	1,817	88	2,693	579	23,982	544	4.4
ont-----	15	6	8	63	3,483	64	3,476	-	-	127	6,959	65	10.7
ebr-----	55	27	29	356	15,484	77	2,900	15	300	448	18,684	271	6.9
ev------	6	3	4	42	4,126	1	1,169	-	-	43	5,295	14	37.8
. H-----	10	9	17	248	12,615	73	2,480	2	153	323	15,248	43	35.5
. J-----	9	9	26	453	25,273	36	1,850	1	165	490	27,288	107	25.5
. Mex---	11	6	6	32	3,794	4	1,636	7	2,095	43	7,525	40	18.8
. Y-----	54	49	190	3,823	179,851	2,800	98,855	-	-	6,623	278,706	1,173	23.8
. C-----	83	42	54	788	46,501	44	1,773	93	4,200	925	52,474	232	22.6
. Dak---	26	18	19	156	5,529	46	1,058	73	1,352	275	7,939	227	3.5
hio-----	83	86	166	2,360	94,135	1,496	40,097	5	154	3,861	134,386	568	23.7
kla-----	48	14	17	212	12,866	29	1,112	5	238	246	14,216	189	7.5
reg-----	26	17	23	459	25,910	115	3,630	5	150	579	29,690	129	23.0
a-------	61	59	199	4,516	175,563	1,353	38,114	-	-	5,869	213,677	787	27.2
. R 3/--	14	1	5	20	4,575	-	-	24	4,520	44	9,095	-	-
. I-----	5	2	3	47	2,445	2	19	-	-	49	2,464	10	24.6
. C-----	33	20	20	244	22,376	1	47	16	645	261	23,068	87	26.5
. Dak 3/	44	20	12	167	6,742	296	8,264	-	-	463	15,006	224	6.7
enn-----	60	43	39	510	28,654	5	171	57	1,627	572	30,452	444	6.9
ex------	82	26	28	349	28,120	13	800	12	690	374	29,610	459	6.5
tah-----	22	15	18	415	20,991	39	1,147	-	-	454	22,138	85	26.0
t-------	13	29	63	927	47,023	504	19,478	-	-	1,431	66,501	234	28.4
a-------	78	54	49	995	57,649	55	1,818	2	335	1,052	59,802	280	21.4
ash-----	24	24	44	451	26,345	32	966	-	-	483	27,311	214	12.8
. Va----	24	12	19	147	6,613	17	646	61	1,484	225	8,743	102	8.6
is------	69	57	159	3,026	128,895	11,871	367,203	-	-	14,897	496,098	2,078	23.9
yo------	6	5	5	28	1,134	31	1,499	-	-	59	2,633	25	10.5
Total or percent	2,060	1,418	2,378	38,879	2,058,592	26,259	839,838	1,160	56,957	66,298	2,955,387	15,477	19.1

1/ Preliminary figures for average number of milk cows on farms excluding heifers not yet fresh; estimated by the Statistical Reporting Service.
2/ Percentage of cows included in the National Cooperative Dairy Herd Improvement Program.
3/ Based on last report available (1-1-65).

TABLE 2.--Growth of Dairy Herd Improvement Association work in the United States (1906-1966, inclusive)

Year	Associa-tions 1/	Super-visors 1/	Standard Plan							
						Average production				
			Herds	Cows	Cows per herd	Herds reported	Cows reported	Milk	Fat	Fat
	Number	Number	Number	Number	Number	Number	Number	Pounds	Percent	Pounds
1906---	1	-	31	239	7.7	-	-	5,300	4.06	215
1907---	4	-	-	1,606	-	-	-	5,366	4.10	220
1908---	6	-	-	3,921	-	-	-	-	-	-
1909---	25	-	-	11,921	-	-	-	-	-	-
1910---	40	-	-	2/25,000	-	-	-	2/5,730	3.96	2/227
1911---	64	-	-	2/40,000	-	-	-	-	-	-
1912---	82	-	-	2/43,000	-	-	-	-	-	-
1913---	100	-	-	47,150	-	-	-	-	-	-
1914---	163	-	-	73,280	-	-	-	-	-	-
1915---	211	-	-	105,526	-	-	-	-	-	-
1916---	346	-	-	150,677	-	-	-	-	-	-
1917---	459	-	11,720	216,831	18.5	-	-	-	-	-
1918---	353	-	9,778	172,518	17.6	-	-	-	-	-
1919---	385	-	10,000	167,313	16.7	-	-	-	-	-
1920---	468	-	11,948	203,472	17.0	-	-	6,175	4.00	247
1921---	452	-	11,209	193,928	17.3	-	-	-	-	-
1922---	513	-	12,508	215,321	17.2	-	-	-	-	-
1923---	627	-	16,357	277,010	16.9	-	-	-	-	-
1924 3/	-	-	-	-	-	-	-	-	-	-
1925---	732	-	18,677	307,073	16.4	-	42,302	7,189	3.95	284
1926---	777	-	19,540	327,653	16.8	-	103,443	7,331	3.96	290
1927---	837	-	21,128	362,014	17.1	-	116,509	7,411	3.95	293
1928---	947	-	23,327	414,891	17.8	-	152,412	7,476	3.96	296
1929---	1,090	-	26,182	465,804	17.8	-	194,859	7,498	3.97	298
1930---	1,143	-	27,888	507,549	18.2	-	235,624	7,642	3.96	303
1931---	1,112	-	26,308	510,714	19.4	-	219,924	7,812	3.92	306
1932---	1,005	-	20,351	427,044	21.0	-	186,683	7,858	3.95	310
1933---	881	-	15,447	358,501	23.2	-	163,014	7,849	3.99	313
1934---	793	-	13,694	325,837	23.8	-	203,930	8,015	4.02	322
1935---	809	-	15,573	364,218	23.4	-	200,367	7,977	4.04	322
1936---	876	-	17,344	404,412	23.3	-	257,248	7,912	4.03	319
1937---	992	-	20,772	496,562	23.9	-	354,568	7,923	4.04	320
1938---	1,106	-	23,701	558,993	23.6	-	448,025	7,831	4.05	317
1939---	1,228	-	25,949	625,284	24.1	-	507,563	7,977	4.05	323
1940---	1,300	-	27,948	676,141	24.2	-	545,382	8,133	4.07	331
1941---	1,383	-	31,381	763,502	24.3	-	591,103	8,225	4.07	335
1942---	1,421	-	32,957	816,117	24.8	-	514,758	8,323	4.07	339
1943---	1,057	-	24,155	616,972	25.5	-	375,914	8,325	4.06	338
1944---	954	-	20,825	561,587	27.0	-	383,337	8,296	4.05	336
1945---	949	-	21,254	577,200	27.2	-	384,360	8,592	4.03	346
1946---	1,124	-	23,331	627,878	27.0	-	413,554	8,635	4.04	349
1947---	1,426	-	28,812	775,546	26.9	-	533,061	8,638	4.03	348
1948---	1,668	-	33,274	886,129	26.6	-	620,385	8,675	4.03	350
1949---	1,787	-	35,851	943,939	26.3	-	729,150	8,907	4.03	359
1950---	1,973	-	40,100	1,088,872	27.2	-	836,922	9,172	4.03	370
1951---	2,143	-	42,949	1,186,615	27.6	-	885,859	9,195	4.02	370
1952---	2,109	-	40,105	1,166,297	29.1	-	928,376	9,192	3.98	366
1953---	2,151	-	40,983	1,226,588	29.9	-	1,020,326	9,253	3.98	368
1954---	2,175	-	41,254	1,311,698	31.8	-	1,079,557	9,363	3.97	372
1955---	2,288	-	41,240	1,333,866	32.3	-	1,175,378	9,502	3.95	375
1956---	2,266	-	40,984	1,406,306	34.4	-	1,229,971	9,713	3.94	383
1957 4/	1,700	2,310	41,638	1,479,799	35.5	-	1,256,129	9,894	3.93	389
1958---	1,544	2,293	39,985	1,548,884	38.7	-	1,345,750	10,068	3.91	394
1959---	1,500	2,337	40,284	1,607,538	39.9	-	1,406,665	10,327	3.88	401
1960---	1,509	2,397	41,293	1,746,752	42.3	-	5/1,343,725	5/10,561	5/3.87	5/409
1961---	1,395	2,448	42,558	1,867,469	43.9	28,649	1,280,785	10,796	3.87	418
1962---	1,436	2,472	42,034	1,958,355	46.6	32,794	1,531,826	11,032	3.86	426
1963---	1,441	2,516	41,937	2,006,534	47.8	35,378	1,674,803	11,286	3.85	434
1964---	1,420	2,474	40,670	2,010,144	49.4	35,689	1,746,475	11,685	3.83	447
1965---	1,424	2,439	40,075	2,087,581	52.1	35,604	1,821,252	11,976	3.82	457
1966---	1,418	2,378	38,879	2,058,592	52.9	-	-	-	-	-

1/ Number of associations and supervisors include all plans.
2/ Estimated.
3/ Date for collecting data changed in 1924 from July 1 to January 1.
4/ Prior to 1957 associations were counted on the basis of supervisor circuits.
5/ National testing year changed in 1960 to begin May 1. These values are averages of 1959 and 1961.

TABLE 3.--Standard DHIA recordkeeping in the United States
(January 1, 1966)

State	Counties	Herds	Cows	Av. cows per herd	All milk cows 1/	DHIA cows as pct. of all milk cows 2/
	Number	Number	Number	Number	Thousands	Percent
Ala-----------	50	313	28,917	92.4	194	14.9
Alaska--------	2	5	196	39.2	2	9.8
Ariz----------	6	90	15,956	177.3	51	31.3
Ark-----------	13	78	3,437	44.1	162	2.1
Calif---------	42	1,870	346,141	185.1	783	44.2
Colo----------	16	221	15,526	70.3	106	14.6
Conn----------	8	420	22,664	54.0	72	31.5
Del-----------	3	97	4,744	48.9	22	21.6
Fla-----------	28	116	19,018	163.9	178	10.7
Ga------------	90	394	29,550	75.0	170	17.4
Hawaii--------	1	13	2,300	176.9	15	15.3
Idaho---------	27	559	24,983	44.7	178	14.0
Ill-----------	82	1,508	61,102	40.5	447	13.7
Ind-----------	81	1,176	46,228	39.3	363	12.7
Iowa----------	96	1,758	59,640	33.9	734	8.1
Kans----------	54	782	33,751	43.2	268	12.6
Ky------------	80	520	22,000	42.3	431	5.1
La------------	23	71	5,929	83.5	203	2.9
Maine---------	14	415	18,108	43.6	82	22.1
Md------------	20	789	44,896	56.9	203	22.1
Mass----------	11	455	20,768	45.6	79	26.3
Mich----------	72	1,956	85,234	43.6	604	14.1
Minn----------	85	3,774	124,103	32.9	1,231	10.1
Miss----------	40	232	17,237	74.3	268	6.4
Mo------------	72	433	19,472	45.0	544	3.6
Mont----------	8	63	3,483	55.3	65	5.4
Nebr----------	52	356	15,484	43.5	271	5.7
Nev-----------	5	42	4,126	98.2	14	29.5
N. H----------	9	248	12,615	50.9	43	29.3
N. J----------	9	453	25,273	55.8	107	23.6
N. Mex--------	8	32	3,794	118.6	40	9.5
N. Y----------	54	3,823	179,851	47.0	1,173	15.3
N. C----------	82	788	46,501	59.0	232	20.0
N. Dak--------	26	156	5,529	35.4	227	2.4
Ohio----------	83	2,360	94,135	39.9	568	16.6
Okla----------	48	212	12,866	60.7	189	6.8
Oreg----------	24	459	25,910	56.4	129	20.1
Pa------------	61	4,516	175,563	38.9	787	22.3
P. R 3/-------	5	20	4,575	228.8	-	-
R. I----------	5	47	2,445	52.0	10	24.5
S. C----------	33	244	22,376	91.7	87	25.7
S. Dak 3/-----	30	167	6,742	40.4	224	3.0
Tenn----------	53	510	28,654	56.2	444	6.5
Tex-----------	73	349	28,120	80.6	459	6.1
Utah----------	18	415	20,991	50.6	85	24.7
Vt------------	13	927	47,023	50.7	234	20.1
Va------------	78	995	57,649	57.9	280	20.6
Wash----------	24	451	26,345	58.4	214	12.3
W. Va---------	24	147	6,613	45.0	102	6.5
Wis-----------	69	3,026	128,895	42.6	2,078	6.2
Wyo-----------	6	28	1,134	40.5	25	4.5
Total, average, or percent--	1,916	38,879	2,058,592	52.9	15,477	13.3

1/ Preliminary figures for average number of milk cows on farms excluding heifers not yet fresh; estimated by the Statistical Reporting Service.
2/ Percentage of cows included in the Standard (including DHIR) recordkeeping plan.
3/ Based on last report available (1-1-65).

TABLE 4.--Owner-Sampler recordkeeping in the United States
(January 1, 1966)

State	Counties Number	Herds Number	Cows Number	Av. cows per herd Number	All milk cows 1/ Thousands	O.S. cows as pct. of all milk cows 2/ Percent
Ala-----------	8	14	769	54.9	194	0.4
Alaska--------	1	4	135	33.8	2	6.8
Ariz----------	3	49	8,852	180.7	51	17.4
Ark-----------	10	41	1,640	40.0	162	1.0
Calif---------	31	209	21,912	104.8	783	2.8
Colo----------	7	18	953	52.9	106	.9
Conn----------	8	91	4,825	53.0	72	6.7
Del-----------	2	12	313	26.1	22	1.4
Fla-----------	5	5	1,442	288.4	178	.8
Ga------------	1	3	231	77.0	170	.1
Hawaii--------	-	-	-	-	15	-
Idaho---------	7	15	387	25.8	178	.2
Ill-----------	35	417	13,888	33.3	447	3.1
Ind-----------	11	295	10,307	34.9	363	2.8
Iowa----------	86	1,580	39,045	24.7	734	5.3
Kans----------	29	113	3,605	31.9	268	1.3
Ky------------	14	42	1,557	37.1	431	.4
La------------	6	14	1,113	79.5	203	.5
Maine---------	12	99	3,766	38.0	82	4.6
Md------------	9	87	3,944	45.3	203	1.9
Mass----------	9	81	2,668	32.9	79	3.4
Mich----------	71	1,729	55,704	32.2	604	9.2
Minn----------	81	2,277	60,649	26.6	1,231	4.9
Miss----------	2	2	108	54.0	268	-
Mo------------	13	58	1,817	31.3	544	.3
Mont----------	7	64	3,476	54.3	65	5.3
Nebr----------	16	77	2,900	37.7	271	1.1
Nev-----------	1	1	1,169	1169.0	14	8.4
N. H----------	10	73	2,480	34.0	43	5.8
N. J----------	5	36	1,850	51.4	107	1.7
N. Mex--------	2	4	1,636	409.0	40	4.1
N. Y----------	54	2,800	98,855	35.3	1,173	8.4
N. C----------	19	44	1,773	40.3	232	.8
N. Dak--------	17	46	1,058	23.0	227	.5
Ohio----------	80	1,496	40,097	26.8	568	7.1
Okla----------	16	29	1,112	38.3	189	.6
Oreg----------	21	115	3,630	31.6	129	2.8
Pa------------	61	1,353	38,114	28.2	787	4.8
P. R 3/-------	-	-	-	-	-	-
R. I----------	2	2	19	9.5	10	.2
S. C----------	1	1	47	47.0	87	.1
S. Dak 3/-----	38	296	8,264	27.9	224	3.7
Tenn----------	4	5	171	34.2	444	-
Tex-----------	13	13	800	61.5	459	.2
Utah----------	12	39	1,147	29.4	85	1.3
Vt------------	13	504	19,478	38.6	234	8.3
Va------------	14	55	1,818	33.1	280	.6
Wash----------	10	32	966	30.2	214	.5
W. Va---------	7	17	646	38.0	102	.6
Wis-----------	69	11,871	367,203	30.9	2,078	17.7
Wyo-----------	3	31	1,499	48.4	25	6.0
Total, average, or percent--	956	26,259	839,838	32.0	15,477	5.4

1/ Preliminary figures for average number of milk cows on farms during year excluding heifers not yet fresh; estimated by the Statistical Reporting Service.

2/ Percentage of cows included in the Owner-Sampler recordkeeping plan.

3/ Based on last report available (1-1-65).

TABLE 5.--Weigh-a-Day-a-Month recordkeeping in the United States
(January 1, 1966)

State	Counties	Herds	Cows	Av. cows per herd	All milk cows 1/	WADAM cows as pct. of all milk cows 2/
	Number	Number	Number	Number	Thousands	Percent
Ala----------	14	24	1,477	61.5	194	0.8
Alaska--------	-	-	-	-	2	-
Ariz---------	-	-	-	-	51	-
Ark----------	6	12	360	30.0	162	.2
Calif--------	-	-	-	-	783	-
Colo---------	-	-	-	-	106	-
Conn---------	-	-	-	-	72	-
Del----------	1	3	56	18.7	22	.3
Fla----------	9	17	4,704	276.7	178	2.6
Ga-----------	22	54	5,788	107.2	170	3.4
Hawaii-------	2	3	132	44.0	15	.9
Idaho--------	-	-	-	-	178	-
Ill----------	36	258	7,577	29.4	447	1.7
Ind----------	-	-	-	-	363	-
Iowa---------	3	12	250	20.8	734	-
Kans---------	10	10	300	30.0	268	.1
Ky-----------	12	56	1,845	32.9	431	.4
La-----------	28	165	10,467	63.4	203	5.2
Maine--------	2	5	200	40.0	82	.2
Md-----------	-	-	-	-	203	-
Mass---------	-	-	-	-	79	-
Mich---------	-	-	-	-	604	-
Minn---------	-	-	-	-	1,231	-
Miss---------	10	75	3,000	40.0	268	1.1
Mo-----------	12	88	2,693	30.6	544	.5
Mont---------	-	-	-	-	65	-
Nebr---------	8	15	300	20.0	271	.1
Nev----------	-	-	-	-	14	-
N. H---------	1	2	153	76.5	43	.4
N. J---------	1	1	165	165.0	107	.2
N. Mex-------	4	7	2,095	299.3	40	5.2
N. Y---------	-	-	-	-	1,173	-
N. C---------	36	93	4,200	45.2	232	1.8
N. Dak-------	26	73	1,352	18.5	227	.6
Ohio---------	1	5	154	30.8	568	-
Okla---------	3	5	238	47.6	189	.1
Oreg---------	3	5	150	30.0	129	.1
Pa-----------	-	-	-	-	787	-
P. R 3/-------	14	24	4,520	188.3	-	-
R. I---------	-	-	-	-	10	-
S. C---------	5	16	645	40.3	87	.7
S. Dak 3/-----	-	-	-	-	224	-
Tenn---------	24	57	1,627	28.5	444	.4
Tex----------	12	12	690	57.5	459	.2
Utah---------	-	-	-	-	85	-
Vt-----------	-	-	-	-	234	-
Va-----------	2	2	335	167.5	280	.1
Wash---------	-	-	-	-	214	-
W. Va--------	22	61	1,484	24.3	102	1.5
Wis----------	-	-	-	-	2,078	-
Wyo----------	-	-	-	-	25	-
Total, average, or percent--	329	1,160	56,957	49.1	15,477	.4

1/ Preliminary figures for average number of milk cows on farms during year excluding heifers not yet fresh; estimated by the Statistical Reporting Service.

2/ Percentage of cows included in the Weigh-a-Day-a-Month recordkeeping plan.

3/ Based on last report available (1-1-65).

TABLE 6.--Herds and cows enrolled in State and regional computing centers
(January 1, 1966)

State	Standard DHIA (Incl. DHIR)				Dairy Herd Improvement Registry		Owner-Sampler		Total machine processing 1/		Machine-processing as percent of total recordkeeping 1/	
	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows
	Number	Number	Pct.2/	Pct.2/	Number	Number	Number	Number	Number	Number	Pct.	Pct.
Ala-------	313	28,917	100.0	100.0	16	1,455	9	476	322	29,393	91.7	94.3
Alaska----	5	196	100.0	100.0	3	101	4	135	9	331	100.0	100.0
Ariz------	37	5,618	41.1	35.2	15	2,614	2	133	39	5,751	28.1	23.2
Ark-------	78	3,437	100.0	100.0	14	567	41	1,640	119	5,077	90.8	93.4
Calif-----	290	63,610	15.5	18.4	76	12,053	6	1,637	296	65,247	14.2	17.7
Colo------	221	15,526	100.0	100.0	35	1,981	17	874	238	16,400	99.6	99.5
Conn------	420	22,664	100.0	100.0	93	5,305	61	2,731	481	25,395	94.1	92.4
Del-------	97	4,744	100.0	100.0	7	316	12	313	109	5,057	97.3	98.9
Fla-------	116	19,018	100.0	100.0	9	1,053	1	135	117	19,153	84.8	76.1
Ga--------	394	29,550	100.0	100.0	39	3,339	3	231	423	33,265	93.8	93.5
Hawaii----	5	676	38.5	29.4	-	-	-	-	5	676	31.3	27.8
Idaho-----	330	15,369	59.0	61.5	40	1,529	14	326	344	15,695	59.9	61.9
Ill-------	1,508	61,102	100.0	100.0	141	6,164	269	8,938	1,890	73,540	86.6	89.1
Ind-------	1,176	46,228	100.0	100.0	199	7,539	85	2,513	1,261	48,741	85.7	86.2
Iowa------	1,758	59,640	100.0	100.0	248	8,506	1,183	28,883	2,941	88,523	87.8	89.5
Kans------	782	33,751	100.0	100.0	130	4,650	113	3,605	895	37,356	98.9	99.2
Ky--------	520	22,000	100.0	100.0	57	2,300	42	1,557	573	23,857	92.7	93.9
La--------	59	4,654	83.1	78.5	5	440	14	1,113	238	16,234	95.2	92.7
Maine-----	415	18,108	100.0	100.0	60	2,829	99	3,766	514	21,874	99.0	99.1
Md--------	743	41,647	94.2	92.8	117	8,023	83	3,794	826	45,441	94.3	93.0
Mass------	439	19,989	96.5	96.2	79	3,805	72	2,393	511	22,382	95.3	95.5
Mich------	1,956	85,234	100.0	100.0	242	12,111	1,580	51,104	3,536	136,338	96.0	96.7
Minn------	3,331	110,652	88.3	89.2	181	6,938	2,068	55,081	5,399	165,733	89.2	89.7
Miss------	227	16,933	97.8	98.2	22	1,464	2	108	239	17,441	77.3	85.7
Mo--------	433	19,472	100.0	100.0	66	3,262	36	1,211	469	20,683	81.0	86.2
Mont------	45	2,349	71.4	67.4	9	469	45	2,529	90	4,878	70.9	70.1
Nebr------	334	14,516	93.8	93.7	54	2,641	77	2,900	411	17,416	91.7	93.2
Nev-------	34	3,726	81.0	90.3	11	902	1	1,169	35	4,895	81.4	92.4
N. H------	248	12,615	100.0	100.0	52	2,440	51	1,760	301	14,528	93.2	95.3
N. J------	453	25,273	100.0	100.0	64	3,582	36	1,850	490	27,288	100.0	100.0
N. Mex----	30	3,496	93.8	92.1	11	716	-	-	30	3,496	81.1	61.6
N. Y------	3,823	179,851	100.0	100.0	419	2,095	2,397	85,253	6,220	265,104	93.9	95.1
N. C------	788	46,501	100.0	100.0	84	5,175	44	1,773	913	51,974	98.7	99.0
N. Dak----	150	5,329	96.2	96.4	20	799	28	804	230	6,989	83.6	88.0
Ohio------	2,360	94,135	100.0	100.0	499	20,909	464	12,308	2,824	106,443	73.1	79.2
Okla------	212	12,866	100.0	100.0	46	2,599	29	1,112	241	13,978	98.0	98.3
Oreg------	266	16,450	58.0	63.5	40	2,310	45	1,870	311	18,320	53.7	61.7
Pa--------	4,516	175,563	100.0	100.0	265	12,104	1,353	38,114	5,869	213,677	100.0	100.0
P. R 3/---	20	4,575	100.0	100.0	-	-	-	-	20	4,575	45.5	50.3
R. I------	45	2,325	95.7	95.1	20	841	1	11	46	2,336	93.9	94.8
S. C------	244	22,376	100.0	100.0	39	3,852	1	47	245	22,423	93.9	97.2
S. Dak 3/-	167	6,742	100.0	100.0	29	1,233	45	1,337	212	8,079	45.8	53.8
Tenn------	510	28,654	100.0	100.0	59	4,125	5	171	518	29,000	90.6	95.2
Tex-------	318	25,898	91.1	92.1	60	5,000	11	592	334	26,890	89.3	90.8
Utah------	415	20,991	100.0	100.0	28	1,609	39	1,147	454	22,138	100.0	100.0
Vt--------	681	33,804	73.5	71.9	112	4,040	207	7,258	888	41,062	62.1	61.7
Va--------	995	57,649	100.0	100.0	105	7,750	55	1,818	1,052	59,802	100.0	100.0
Wash------	451	26,345	100.0	100.0	104	5,884	32	966	483	27,311	100.0	100.0
W. Va-----	77	3,877	52.4	58.6	18	934	2	76	140	5,437	62.2	62.2
Wis-------	3,026	128,895	100.0	100.0	524	22,873	8,328	258,662	11,354	387,557	76.2	78.1
Wyo-------	28	1,134	100.0	100.0	4	252	31	1,499	59	2,633	100.0	100.0
Total or percent-	35,889	1,704,670	92.3	82.8	4,570	213,478	19,143	597,723	55,564	2,327,812	83.8	78.8

1/ Includes WADAM Testing: Georgia, 26 herds, 3,484 cows; Illinois, 113 herds, 3,500 cows; Kentucky, 11 herds, 300 cows; Louisiana, 165 herds, 10,467 cows; Mississippi, 10 herds, 400 cows; New Hampshire, 2 herds, 153 cows; New Jersey, 1 herd, 165 cows; North Carolina, 81 herds, 3,700 cows; North Dakota, 52 herds, 856 cows; Tennessee, 3 herds, 175 cows; Texas, 5 herds, 400 cows; Virginia, 2 herds, 335 cows; West Virginia, 61 herds, 1,484 cows.
Total - 532 herds, 25,419 cows.

2/ Percent of Standard DHIA and DHIR herds or cows enrolled in machine-processing.

3/ Based on last report available (1-1-65).

TABLE 7.--Ten-year production summary: U.S. cows and DHIA cows (1956-1965)

Year	U. S. Report for all milk cows					Standard Plan DHIA, production/cow			All DHIA plans	
	Milk cows 1/	Milk produced	Production/cow			Milk	Fat	Fat	Cows	DHIA cows as pct. of U. S. cows
			Milk	Fat	Fat					
	Thousands	Mil. Lb.	Lb.	Pct.	Lb.	Lb.	Pct.	Lb.	Thousands	Pct.
1956	20,501	124,860	6,090	3.83	233	9,713	3.94	383	2/1,906	2/9.3
1957	19,774	124,628	6,303	3.81	240	9,894	3.93	389	2,118	10.7
1958	18,711	123,220	6,585	3.78	249	10,068	3.91	394	2,232	11.9
1959	17,901	121,989	6,815	3.76	256	10,327	3.88	401	2,439	13.6
1960	17,560	122,951	7,002	3.76	263	3/10,561	3/3.87	3/409	2,594	14.8
1961	17,367	125,442	7,223	3.75	271	10,796	3.87	418	2,727	15.7
1962	17,050	126,021	7,391	3.73	276	11,032	3.86	426	2,784	16.3
1963	16,534	125,009	7,561	3.72	281	11,286	3.85	434	2,823	17.1
1964	16,061	127,000	7,907	3.71	293	11,685	3.83	447	2,963	18.4
1965	4/15,477	4/125,061	4/8,080	4/3.70	4/299	11,976	3.82	457	2,955	19.1

1/ Average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service.

2/ Report of WADAM testing included for first time.

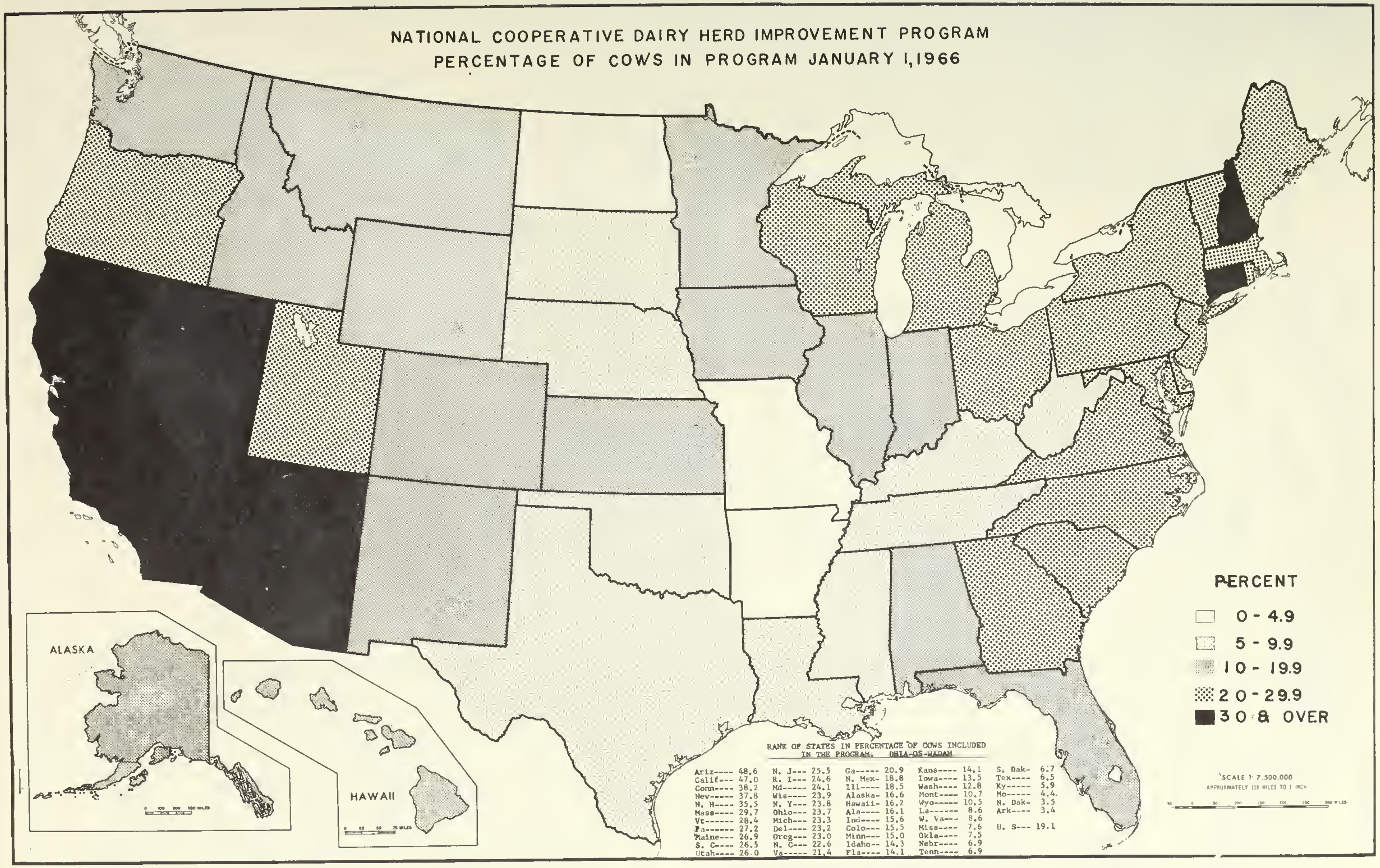
3/ National testing year changed in 1960 to begin May 1. These values are averages of 1959 and 1961.

4/ USDA Statistical Reporting Service, Milk Production and Dairy Products, Annual Statistical Summary 1965, February 1966. Data are preliminary.

TABLE 8.--Counties, by State, with 25 percent or more cows included in the National Cooperstive Dairy Herd Improvement Program (January 1, 1966)

State	County	Cows enrolled in DHIA plans Percent
ALABAMA		
	Montgomery	46
	Blount	45
	Elmore	43
	Tallsdega	33
	Jefferson	32
	Russell	31
	St. Clair	28
	Etowah	26
	Shelby	25
ARIZONA		
	Pima	97
	Greenlee	89
	Pinal	87
	Cochise	80
	Graham	58
	Maricopa	58
CALIFORNIA		
	Monterey	96
	Contra Costa	93
	Santa Barbara	66
	Madera	65
	Ventura	65
	Marin	63
	San Diego	63
	Kern	62
	Lassen	62
	Fresno	58
	Riverside	57
	Del Norte	56
	San Joaquin	54
	Sonoma	53
	Tehama	52
	Tulare	52
	San Luis Obispo	51
	Stanislaus	50
	Merced	48
	Placer	47
	Sacramento	45
	San Bernardino	45
	Napa	44
	Nevada	41
	Colusa	40
	Santa Clara	39
	Shasta	38
	Kings	36
	San Benito	36
	Solano	35
	Sutter	35
	Los Angeles	33
	Inyo	31
	Yuba	31
	Humboldt	28
	Tuolumne	28
	Glenn	26
COLORADO		
	Chaffee	39
	Pueblo	34
	Delta	29
	Mesa	26
	Huerfano	25
	Weld	25
CONNECTICUT		
	Tolland	52
	Litchfield	45
	Windham	41
	Hartford	40
	New Haven	38
	Middlesex	36
	New London	25
DELAWARE		
	Sussex	39
FLORIDA		
	Orange	69
	Manatee	65
	Gilchrist	62
	Osceola	60
	Washington	54
	Jackson	51
	Putnam	51
	Madison	43
FLORIDA (con't.)		
	Seminole	43
	Jefferson	42
	Dade	36
	Alachua	35
	Sumter	30
	Leon	26
	Sarasota	26
GEORGIA		
	Macon	88
	Houston	81
	Sumter	80
	Newton	74
	Douglas	71
	Jefferson	70
	Rockdale	69
	Clarke	62
	Mitchell	62
	Butts	60
	Rabun	60
	Coffee	58
	Thomas	56
	Worth	55
	Jeff Davis	54
	Peach	54
	Spalding	50
	Walton	49
	Decatur	47
	Jones	47
	Lee	45
	Monroe	45
	Fayette	43
	Richmond	43
	Baldwin	42
	Jasper	42
	Clayton	41
	Brooks	40
	Tattnall	40
	De Kalb	38
	Floyd	38
	McDuffie	36
	Carroll	35
	Dooly	35
	Troup	34
	Laurens	33
	Morgan	31
	Heard	30
	McIntosh	30
	Polk	30
	Henry	29
	Walker	28
	Cook	27
	Dougherty	27
ILLINOIS		
	Lawrence	48
	Stark	39
	Kendall	38
	Jasper	35
	Christian	33
	Menard	32
	Bond	31
	Champaign	28
	Coles	28
	Jefferson	27
	McHenry	27
	Monroe	27
	Wabash	26
	De Kalb	25
INDIANA		
	Cass	29
	Boone	28
	Elkhart	28
IOWA		
	Dallas	35
	Webster	35
	Lee	30
	Polk	28
	Story	28
	Sac	27
	Jasper	26
KANSAS		
	Comanche	44
	Pawnee	44
KANSAS (con't.)		
	Saline	43
	Stevens	42
	Finney	41
	Harper	34
	Harvey	34
	Edwards	32
	Marion	30
	Chase	29
	Meade	29
	Reno	29
	Cowley	27
LOUISIANA		
	Bossier	36
	Quachita	36
	Franklin	34
	West Carroll	32
	Lincoln	31
	Iberia	30
	Richland	29
	Rapides	27
	Beauregard	26
MAINE		
	Oxford	46
	Androscoggin	40
	Cumberland	34
	Penobscot	30
	Somerset	27
	York	27
	Hancock	26
	Waldo	26
MARYLAND		
	Howard	52
	Dorchester	45
	Montgomery	35
	Carroll	30
	Harford	30
	Cecil	29
	Kent	29
MASSACHUSETTS		
	Berkshire	40
	Franklin	33
	Hampshire	33
	Essex	31
	Barnstable	29
	Worcester	29
	Plymouth	27
MICHIGAN		
	Oscoda	43
	Ingham	41
	Lenawee	41
	Kalamazoo	38
	Barry	37
	Calhoun	37
	Jackson	35
	Shiawassee	35
	Branch	31
	Clinton	31
	Hillsdale	31
	Muskegon	31
	St. Joseph	31
	Gratiot	30
	Ionia	30
	Monroe	30
	Eaton	29
	Alger	26
	Berrien	26
	Genesee	26
	Mason	26
	Oakland	26
	Van Buren	26
	Iosco	25
	Lapeer	25
MINNESOTA		
	Dakota	32
	Goodhue	28
	Ramsey	28
	Winona	27
	Martin	26
	Olmsted	26
MISSOURI		
	St. Francois	39
MONTANA		
	Gallatin	42
	Csscade	25
	Flathesd	25
NEBRASKA		
	Douglas	25
	Lancaster	25
	Seward	25
NEVADA		
	Lincoln	100
	Clark	81
	Churchill	57
	Douglas	51
	Washoe	38
NEW HAMPSHIRE		
	Sullivan	49
	Merrimack	45
	Cheshire	44
	Hillsborough	39
	Grafton	31
	Rockingham	30
	Coos	29
	Belknap	27
	Strafford-Carroll	26
NEW JERSEY		
	Somerset	37
	Burlington	35
	Morris	27
	Salem-Cumberland	26
NEW MEXICO		
	Dona Ana	72
	Otero	27
	Bernalillo	25
NEW YORK		
	Ontario	48
	Columbia	46
	Dutchess	45
	Suffolk	45
	Tompkins	42
	Genesee	41
	Wayne	36
	Onandaga	34
	Livingston	33
	Schuyler	33
	Schoharie	32
	Orleans	32
	Chenango	31
	Niagara	31
	Cayuga	30
	Monroe	29
	Seneca	29
	Wyoming	29
	Cortland	27
	Chautauqua	25
	Tioga	25
NORTH CAROLINA		
	Carteret	100
	Lee	100
	Swain	100
	Hyde	88
	Pitt	82
	Harnett	80
	Beaufort	77
	Nash	75
	Perquimans	67
	Durham	64
	Macon	64
	Person	63
	Orange	61
	Brunswick	60
	Moore	60
	Caswell	58
	Pamlico	57
	Lenoir	56
	Wake	56
	Duplin	54
	Guilford	52
	Bertie	50
	Columbus	50
	Jones	50
	New Hanover	50

NATIONAL COOPERATIVE DAIRY HERD IMPROVEMENT PROGRAM
PERCENTAGE OF COWS IN PROGRAM JANUARY 1,1966



RANK OF STATES IN PERCENTAGE OF COWS INCLUDED IN THE PROGRAM: DHIA-OS-WADAM

Ariz----	48.6	N. J---	25.5	Ga-----	20.9	Kans----	14.1	S. Dak-	6.7
Calif---	47.0	R. I---	24.6	N. Mex-	18.8	Iowa----	13.5	Tex----	6.5
Conn----	38.2	Md-----	24.1	Ill----	18.5	Wash----	12.8	Ky-----	5.9
Nev-----	37.8	Wis----	23.9	Alaska-	16.6	Mont----	10.7	Mo-----	4.4
N. H----	35.5	N. Y---	23.8	Hawaii-	16.2	Wyo-----	10.5	N. Dak-	3.5
Mass----	29.7	Ohio---	23.7	Ala----	16.1	La------	8.6	Ark----	3.4
Vt------	28.4	Mich---	23.3	Ind----	15.6	W. Va---	8.6		
Pa------	27.2	Del----	23.2	Colo---	15.5	Miss----	7.6	U. S---	19.1
Maine---	26.9	Oreg---	23.0	Minn---	15.0	Okla----	7.5		
S. C----	26.5	N. C---	22.6	Idaho--	14.3	Nebr----	6.9		
Utah----	26.0	Va-----	21.4	Fla----	14.1	Tenn----	6.9		

TABLE 8.--Counties, by State, with 25 percent or more cows included in the National Cooperative Dairy Herd Improvement Program--Continued (January 1, 1966)

State	County	Cows enrolled in DHIA plans Percent
NORTH CAROLINA (con't.)		
	Onslow	50
	Warren	50
	Washington	50
	Wilson	50
	Wayne	48
	Bladen	47
	Gaston	45
	Craven	43
	Granville	43
	Montgomery	43
	Chatham	42
	Edgecomb	41
	Franklin	40
	Madison	39
	Randolph	39
	Catawba	38
	Cumberland	35
	Halifax	33
	Hoke	33
	Martin	33
	Northampton	33
	Pender	33
	Robeson	33
	Rowan	33
	Scotland	33
	Stanly	33
	Cleveland	32
	Henderson	31
	Polk	31
	Union	31
	Burke	30
	Forsyth	30
	Johnston	30
	Watauga	30
	Sampson	29
	Alamance	28
	Davie	27
	Caldwell	26
	Yadkin	26
OHIO		
	Sandusky	58
	Marion	49
	Medina	46
	Erie	42
	Lorain	39
	Allen	38
	Fulton	38
	Auglaize	37
	Clark	37
	Logan	37
	Champaign	36
	Miami	36
	Ashland	35
	Fairfield	33
	Wayne	31
	Henry	30
	Huron	30
	Wood	30
	Franklin	29
	Holmes	29
	Richland	29
	Hamilton	28
	Seneca	28
	Greene	27
	Madison	27
	Ottawa	27
	Shelby	27
	Jefferson	26
	Portage	26
	Warren	26
	Williams	26
OREGON		
	Klamath	40
	Benton	36
	Lane	35
	Josephine	34
	Washington	32
	Clackamas	30
	Marion	28
OREGON (con't.)		
	Multnomah	25
PENNSYLVANIA		
	Montgomery	45
	Union	43
	Blair	42
	Bucks	39
	Clinton	39
	Dauphin	39
	Mifflin	36
	Northumberland	35
	Huntingdon	34
	Juniata	34
	Lancaster	34
	Potter	34
	Lebanon	33
	Montour	33
	Allegheny	32
	Perry	32
	Berks	31
	Cumberland	31
	Luzerne	31
	Sullivan	31
	Chester	30
	Centre	29
	Columbia	29
	McKean	29
	Indiana	28
	Franklin	27
	Lehigh	27
	Wyoming	27
	Northampton	26
	York	26
	Cambria	25
RHODE ISLAND		
	Washington	39
	Kent	35
SOUTH CAROLINA		
	Orangeburg	49
	Sumter	49
	Bamberg	47
	Kershaw	47
	Saluda	43
	Hampton	42
	Newberry	41
	Jasper	37
	Colleton	36
	Marlboro	36
	Lee	34
	Beaufort	33
	Laurens	27
TEXAS		
	Wichita	80
	Deaf Smith	75
	Goliad	75
	Hutchinson	75
	San Patricio	75
	Starr	75
	Burleson	65
	Milam	60
	Willacy	50
	Kaufman	40
	Bell	30
	Camp	30
	Walker	30
	Wheeler	30
	Cameron	25
	Castro	25
	Randall	25
UTAH		
	Wasatch	48
	Piute	45
	Summit	42
UTAH (con't.)		
	Washington	41
	Salt Lake	39
	Utah	31
	Davis	29
	Sanpete	26
	Weber	26
VERMONT		
	Bennington	46
	Windsor	39
	Addison	38
	Washington	37
	Rutland	30
	Windham	30
	Orange	27
	Franklin	26
	Orleans	26
VIRGINIA		
	Northampton	68
	James City	62
	Lancaster	53
	Powhatan	51
	Clarke	50
	City of Va. Beach	45
	City of Chesapeake	40
	Culpeper	40
	Prince George	39
	Bath	38
	Henrico	38
	Loudoun	38
	Pulaski	37
	Southampton	37
	Dinwiddie	36
	Orange	35
	Isle of Wight	34
	Augusta	33
	Madison	33
	Amelia	32
	Rockingham	32
	Warren	31
	King William	30
	Brunswick	29
	Charlotte	29
	Prince William	29
	Hanover	28
	Fauquier	26
	Roanoke	26
	Spotsylvania	26
WASHINGTON		
	Mid-Columbia	37
	Grant	25
WEST VIRGINIA		
	Mason	31
WISCONSIN		
	Kenosha	44
	Winnebago	42
	Kewaunee	35
	Manitowac	35
	Racine	35
	Rock	33
	Calumet	32
	Walworth	32
	Green Lake	31
	Waukesha	31
	Columbia	30
	Fond du Lac	30
	Dunn	29
	Outagamie	29
	Barron	28
	Brown	26
	St. Croix	26
	Sheboygan	26
	Florence	25
	Jefferson	25
	Washington	25

OFFICIALS IN CHARGE OF DAIRY-HERD-IMPROVEMENT ASSOCIATIONS IN THE STATES

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Alaska-- W. J. Sweetman, Experiment Station Research Staff, University of Alaska, Palmer 99645
Ariz---- W. R. Van Sant, Dept. of Dairy Science, University of Arizona, Tucson 85721
Ark----- L. Ratcliff, Animal Industry & Veterinary Science Dept., University of Arkansas, Little Rock 72203
Calif--- G. S. Goble, Extension Service, University of California, Davis 95616
C. L. Pelissier, Extension Service, University of California, Davis 95616
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Conn---- R. H. Benson, Animal Industries Dept., University of Connecticut, Storrs 06268
Del----- W. R. Hesseltine, Animal & Poultry Science Dept., University of Delaware 19711
Fla----- C. W. Reaves, Extension Dairy Section, University of Florida, Gainesville 32603
Ga------ W. H. McKinney, Animal Industry Division, University of Georgia, Athens 30601
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Ill----- J. G. Cash, Dairy Science Dept., University of Illinois, Urbana 61803
Ind----- S. M. Gregory, Dept. of Animal Sciences, Purdue University, Lafayette 47907
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Kans---- R. Bonewitz, Dairy Science Dept., Kansas State University, Manhattan 66504
Ky------ E. C. Troutman, Dairy Science Dept., University of Kentucky, Lexington 40506
La------ N. J. Matherne, La. Agr. Extension Service, Louisiana State University, Baton Rouge 70803
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Md------ H. T. Heaps, Manager, DHIC, University of Maryland, College Park 20742
Mass---- F. N. Dickinson, Veterinary & Animal Sciences Dept., University of Massachusetts, Amherst 01003
Mich---- M. Wilson, Dairy Dept., Michigan State University, East Lansing 48823
Minn---- R. W. Wayne, Dairy Husbandry Dept., University of Minnesota, St. Paul 55101
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Mo------ A. G. Lane, Dairy Husbandry Dept., University of Missouri, Columbia 65202
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Nebr---- C. W. Nibler, Dairy Science Dept., University of Nebraska, Lincoln 68503
Nev----- H. P. Adams, Animal Science Dept., University of Nevada, Reno 89507
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N. Dak-- G. R. Fisher, Dairy Husbandry Dept., North Dakota State University, Fargo 58103
Ohio---- W. R. Taylor, Dairy Science Dept., Ohio State University, Columbus 43210
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Oreg---- D. E. Anderson, Animal Science Dept.,Oregon State University, Corvallis 97331
Pa------ H. C. Gilmore, Dairy Science Dept., Pennsylvania State University, University Park 16802
P. R---- M. J. Ortiz, Animal Husbandry Dept., University of Puerto Rico, Rio Piedras 00931
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S. C---- C. H. Lomas, Dairy Science Dept., Clemson University, Clemson 29631
S. Dak-- H. D. Hall, Dairy Science Dept., South Dakota State University, Brookings 57007
Tenn---- V. D. Parsons, Dairy Dept., University of Tennessee, P.O. Box 1071, Knoxville 37901
Tex----- J. W. Davis, Jr., Dairy Science Dept., Texas A & M University, College Station 77841
Utah---- J. J. Barnard, Dairy Industry Dept., Utah State University, Logan 84321
Vt------ W. P. Leamy, Animal & Dairy Science Dept., University of Vermont, Burlington 05401
Va------ W. N. Patterson, Dairy Science Dept., Virginia Polytechnic Institute, Blacksburg 24061
Wash---- B. F. Kelso, Animal Sciences Dept., Washington State University, Pullman 99163
W. Va--- R. O. Kelly, Animal Industry & Veterinary Science Dept., West Virginia University, Morgantown 26506
Wis----- E. E. Starkey, Dairy Science Dept., University of Wisconsin, Madison 53706
Wyo----- I. W. Slater, Division of Animal Science, University of Wyoming, Laramie 82071

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National Cooperative Dairy Herd Improvement Program
RECORD BOOK
A plan for every size herd
STANDARD DHIA OWNER SAMPLER WEIGH-A-DAY-A-MONTH
AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

Dairy-Herd-Improvement Letter
ARS-44-177
(Vol. 42, No. 3)

April 1966

ARTIFICIAL INSEMINATION (AI) PARTICIPATION REPORT FOR THE UNITED STATES-1965

An estimated total of 7,879,982 cows were bred artificially in the United States in 1965. Dairy to dairy and beef to beef inseminations were 6,301,178 and 615,147 cows, respectively. Of the 7,264,835 dairy cow total, 13.3 percent, or 963,657, were inseminated by beef bulls.

Because of incomplete reporting the tabular data shown in this report are partly estimations based on averages from complete reports. Included are data on four strictly beef operations and a report of services performed for individual ranchers who have their own beef bulls.

Table 1 shows that 43.7 percent of the nation's cows and heifers bred for dairy purposes were artificially inseminated. An estimated one-tenth of the animals so bred were registered. The top 10 States in number and percentage of dairy cows bred artificially by dairy and beef bulls are listed as follows:

Rank	State	Number of dairy cows bred artificially	State	Percent of dairy cows bred artificially
1	Wis.	1,351,829	Alaska	82.6
2	N. Y.	716,707	Pa.	66.0
3	Minn.	641,692	Conn.	62.6
4	Pa.	570,930	N. Mex.	62.3
5	Calif.	382,603	N. H.	61.4

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Rank	State	Number of dairy cows bred artificially	State	Percent of dairy cows bred artificially
6	Mich.	339,439	Fla.	59.9
7	Ohio	319,896	Wis.	59.2
8	Iowa	282,823	Wash.	58.4
9	Ill.	221,790	Mass.	57.6
10	Wash.	141,243	R. I.	57.6

Table 2 summarizes the AI program since 1939.

Table 3 shows that an estimated 591,859 herds received AI service in 1965. A total of 1,949 dairy and 439 beef bulls were reported in service during 1965. Also reported were inseminations to 3,569 swine and 587 goats.

The accompanying map illustrates the AI density in the United States in 1965.

TABLE 1.--Status of artificial breeding in the United States, January 1, 1966

State and other sources	Studs 1/	Cows bred to dairy sires in 1965		Cows bred to beef sires in 1965		All U.S. milk cows 3/	Dairy cows bred as a percentage of all milk cows 4/
		Regd.dairy 2/	Total dairy	Dairy cows	Beef cows		
	Number	Number	Number	Number	Number	Thousands	Percent
Alabama	0	4,039	40,846	5,324	2,188	207	22.3
Alaska	1	161	1,943	40	73	2.4	82.6
Arizona	0	1,237	13,734	2,120	1,807	56	28.3
Arkansas	0	2,500	21,549	4,201	3,549	173	14.9
California	4	26,589	337,240	45,363	19,044	850	45.0
Colorado	1	5,052	40,888	3,498	6,072	112	39.6
Connecticut	1	6,486	42,833	6,596	1,267	79	62.6
Delaware	0	1,915	7,355	1,439	166	25	35.2
Florida	0	8,683	96,770	14,646	8,727	186	59.9
Georgia	0	7,807	54,118	8,041	4,260	185	33.6
Hawaii	0	1,141	9,430	780	498	18	56.7
Idaho	0	5,276	70,842	8,052	6,247	194	40.7
Illinois	3	31,525	188,958	32,832	20,760	476	46.6
Indiana	1	5,767	118,838	18,993	11,252	385	35.8
Iowa	1	16,589	239,174	43,649	23,893	760	37.2
Kansas	1	10,296	75,592	9,266	23,848	280	30.3
Kentucky	1	14,832	101,184	13,056	19,296	471	24.3
Louisiana	1	8,211	55,029	10,733	6,107	230	28.6
Maine	1	4,590	44,590	5,559	510	88	57.0
Maryland	1	9,679	76,013	9,820	3,085	217	39.6
Massachusetts	0	4,923	41,124	6,663	1,669	83	57.6
Michigan	1	34,437	297,766	41,673	5,409	626	54.2
Minnesota	2	35,819	564,057	77,635	10,094	1,309	49.0
Mississippi	1	6,647	53,918	7,217	2,835	288	21.2
Missouri	0	14,103	110,383	29,535	22,063	565	24.8
Montana	0	873	8,653	5,528	24,687	67	21.2
Nebraska	0	5,724	49,734	9,210	19,337	286	20.6
Nevada	0	243	3,301	520	871	16	23.9
New Hampshire	1	4,570	26,551	2,931	1,171	48	61.4
New Jersey	0	7,097	50,074	8,560	325	112	52.4
New Mexico	0	2,914	24,378	2,392	1,609	43	62.3
New York	1	114,816	629,100	87,607	4,186	1,272	56.3
North Carolina	1	11,981	79,384	11,599	5,147	253	36.0
North Dakota	0	1,228	24,211	4,878	8,033	231	12.6
Ohio	2	50,607	269,416	50,480	20,426	591	54.1
Oklahoma	5/1	3,036	26,003	2,593	9,738	199	14.4
Oregon	0	4,513	59,467	12,608	9,515	140	51.5
Pennsylvania	3	109,035	489,635	81,295	9,701	865	66.0
Puerto Rico	1	5,968	52,540	--	--	--	--
Rhode Island	0	744	5,480	858	148	11	57.6
South Carolina	0	3,916	26,684	2,794	1,741	92	32.0
South Dakota	0	2,879	32,402	5,177	6,393	236	15.9
Tennessee	3	10,319	89,431	10,487	13,158	475	21.0
Texas	0	10,071	85,082	4,669	22,526	486	18.5
Utah	1	3,050	47,358	3,446	3,498	94	54.0
Vermont	0	14,672	106,495	15,810	4,632	253	48.3
Virginia	1	17,254	101,023	13,851	5,769	314	36.6
Washington	2	8,198	116,299	24,944	16,787	242	58.4
West Virginia	0	2,535	19,663	4,368	1,414	106	22.7
Wisconsin	6	90,892	1,162,551	189,278	21,406	2,283	59.2
Wyoming	0	412	5,889	1,043	7,332	27	25.7
AI activity reported by studs, but State unknown 6/	-	744	6,200	--	477	--	--
Armour and Co. 7/	-	--	--	--	95,000	--	--
Internat'l Beef Breeders 7/	-	--	--	--	42,500	--	--
Wye Plantation 7/	-	--	--	--	4,000	--	--
Add'l services involving semen from ranchers' bulls 7/	-	--	--	--	48,901	--	--
United States	44	756,595	6,301,178	963,657	615,147	16,607	43.7

1/ States without studs purchase semen from studs in other States. See table 3 for location of studs.
2/ Data for registered cows may be all or partially estimated when incomplete report was given.
3/ Preliminary figures for number of cows and heifers 2 years old and over kept for milk; estimated by the Statistical Reporting Service.
4/ Percentage of all dairy cows bred included in the artificial insemination program.
5/ One all-beef stud in Oklahoma serviced 2,251 beef cows. See table 3 for name and location of stud.
6/ AI breeding activity reported from: Zimmerman Dairy Farm, 6,200 cows; Codding Cattle Research, 477 cows. Total: 6,677 cows.
7/ Information obtained from National Association of Animal Breeders, P.O. Box 328, Columbia, Mo. 65202.

TABLE 2.--Status of artificial-breeding program in the United States (1939-1966, inclusive)

Year	Studs	Sires in service				Herds 1/	Dairy cows bred to		Beef cows bred to beef bulls	Total cattle bred	Cows bred per sire
		Dairy	Beef	Total	Average per stud		Dairy bulls	Beef bulls			
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
1939	7	--	--	33	4.7	646	--	--	--	7,359	228
1940	25	--	--	138	5.5	2,971	--	--	--	33,977	246
1941	35	--	--	237	6.8	5,997	--	--	--	70,751	299
1942	46	--	--	412	9.0	12,118	--	--	--	112,788	274
1943	59	--	--	574	9.7	23,448	--	--	--	182,524	318
1944	56	--	--	657	11.7	28,627	--	--	--	218,070	332
1945	67	--	--	729	10.9	43,998	--	--	--	360,732	495
1946	78	--	--	900	11.5	73,293	--	--	--	537,376	597
1947	84	--	--	1,453	17.3	140,571	--	--	--	1,184,168	815
1948	91	--	--	1,745	19.2	224,493	--	--	--	1,713,581	982
1949	90	--	--	1,940	21.6	316,177	--	--	--	2,091,175	1,078
1950	97	--	--	2,104	21.7	409,300	--	--	--	2,619,555	1,245
1951	94	--	--	2,187	23.3	548,300	--	--	--	3,509,573	1,605
1952	94	--	--	2,324	24.7	671,100	--	--	--	4,295,243	1,848
1953	96	--	--	2,598	27.1	755,000	--	--	--	4,845,222	1,865
1954	93	--	--	2,661	28.6	805,000	--	--	--	5,155,240	1,937
1955	79	--	--	2,450	31.0	845,900	--	--	--	5,413,874	2,210
1956	79	--	--	2,553	32.3	900,400	--	--	--	5,762,656	2,257
1957	75	--	--	2,651	35.3	946,000	--	--	--	6,055,982	2,284
1958	71	--	--	2,676	37.7	975,372	--	--	--	6,645,568	2,483
1959	64	--	--	2,460	38.4	930,059	--	--	--	6,932,294	2,816
1960	62	--	--	2,544	41.0	910,000	--	--	--	7,144,679	2,808
1961	56	--	--	2,486	44.4	863,781	7,047,148	2/435,592	--	7,482,740	3,010
1962	56	2,036	420	2,456	43.9	862,150	6,837,681	2/911,006	--	7,748,687	3,155
1963	51	2,158	401	2,559	50.2	621,141	6,468,545	969,748	235,289	7,673,582	2,999
1964	50	2,140	398	2,538	50.8	654,311	6,165,599	1,117,395	464,959	7,747,953	3,053
1965	4/46	1,867	449	2,316	50.3	591,859	6,301,178	963,657	615,147	3/7,879,982	3,402
1966	4/44	1,949	439	2,388	54.3	--	--	--	--	--	--

1/ Prior to 1963, number of herds largely reflected membership rather than those actually serviced.
2/ Probably includes some beef to beef inseminations.
3/ Not shown are inseminations to 3,569 swine and 587 goats.
4/ Includes one all-beef stud.

TABLE 3.--Artificial-breeding organization bull studs, January 1, 1966

State, name, and location of studs	Herds serviced	Cows bred in 1965				Number and breed of bulls used									Inseminations of--	
		Dairy total	Dairy to beef	Beef to beef	Total	Ayrshire	Brown Swiss	Guernsey	Holstein	Jersey	Red Dane	Shorthorn	Beef	Total	Swine	Goats
ALASKA																
Matanuska Valley Breeders Assn., Palmer 99645-----	60	971	40	10	1,021	--	--	--	3	--	--	--	--	3	--	--
CALIFORNIA																
Adohr Farms Inseminating Service, Rt. 1, P.O. Box 18, Camarillo 93010-----	35	9,119	--	--	9,119	--	--	14	14	--	--	--	--	28	--	--
Excelsior Breeding Service, 7401 Adams, Rt. 1, Box 128, Corona 91720-------------------	114	25,210	--	250	25,460	--	1	--	19	--	--	--	--	20	--	--
Jessup Breeders, 5471 San Fernando Rd., W., Glendale 91203----------	1,665	81,420	16,241	2,627	100,288	--	2	4	24	3	--	--	4	37	--	53
Pacific Breeders Co-op., Inc., 1464 Middle Two Rock Rd., Petaluma 94952	585	30,765	1/748	1/2,262	33,775	--	--	2	7	6	--	--	1	16	--	--
COLORADO																
Colorado State Univ. ABS, 809 City Park Avenue, Fort Collins 80521------	1/994	10,310	579	2,031	12,920	--	--	--	1	--	--	--	3	4	--	2
CONNECTICUT																
New England Selective Breeding Assn., Inc., Rt. 5, Newton Road, Woodbridge 06525--------	5,908	90,164	1/12,622	1/3,598	106,384	2	3	8	14	8	--	--	7	42	--	16
ILLINOIS																
Curtiss Breeding Service, Inc., Cary 60013--------	1/84,836	916,428	141,440	45,000	1,102,868	4	4	14	80	14	--	3	57	176	--	--
Northern Ill. Breeding Co-op., Rt. 1, Hampshire 60140---------	8,028	73,445	10,477	13,619	97,541	--	8	4	27	--	--	1	--	40	1,492	5
Southern Ill. Breeding Assn., Breese 62230-----	9,730	40,275	10,975	9,001	60,251	--	3	3	13	2	--	--	12	33	--	2
INDIANA																
John A. Newman & Sons, Rt. 2, Box 21, Culver 46511-------------------	1/32	413	--	--	413	--	--	--	5	--	--	--	--	5	--	--
IOWA																
Carnation Farms Breeding Service, Iowa Unit, P.O. Box N, Hiawatha 52233---	1/25,921	93,364	21,027	10,302	124,693	--	4	5	14	2	--	2	20	47	--	4

See footnotes at end of table.

TABLE 3.--Artificial-breeding organization bull studs, January 1, 1966 (con't.)

State, name, and location of studs	Herds serviced	Cows bred in 1965				Number and breed of bulls used									Inseminations of--	
		Dairy total	Dairy to beef	Beef to beef	Total	Ayrshire	Brown Swiss	Guernsey	Holstein	Jersey	Red Dane	Shorthorn	Beef	Total	Swine	Goats
KANSAS																
Kansas ABS Unit, Kansas State Univ., Anderson Hall, Manhattan 66504---	3,220	38,414	4,347	19,298	62,059	3	2	1	19	2	--	2	14	43	--	39
KENTUCKY																
Ky. Artificial Breeding Assn., 1930 Herr Lane, Rt. 6, Louisville 40222-	12,856	69,971	8,000	17,383	95,354	--	2	3	12	8	--	--	4	29	--	--
LOUISIANA																
La. Animal Breeders Co-op., Inc., Box B.D., LSU, Baton Rouge 70803-------	5,668	53,673	10,540	5,900	70,113	--	--	5	10	5	--	--	11	31	--	1
MAINE																
Maine Breeding Co-op., Inc., RFD 1, Augusta 04331-------------------	3,158	37,833	4,320	480	42,633	--	--	7	15	11	--	2	--	35	--	--
MARYLAND																
Maryland-West Virginia Bull Stud, Inc., P.O. Box 555, Frederick 21701	5,452	76,974	10,813	4,108	91,895	4	3	6	21	5	--	--	5	44	--	6
MICHIGAN																
Mich. Animal Breeders Co-op., Inc., P.O. Box 511, East Lansing 48824-	19,235	213,674	29,213	3,000	245,887	--	3	17	40	8	4	4	10	86	--	15
MINNESOTA																
Midwest Genes, Inc., P.O. Box 111, Anoka 55303----	1/50,515	348,452	57,847	28,711	435,010	--	8	17	71	6	--	5	37	2/144	--	--
Minn. Valley Breeders Assn., New Prague 56071-	30,937	264,676	48,309	2,542	315,527	1	4	10	55	--	--	1	27	98	--	--
MISSISSIPPI																
Miss. Animal Breeders Co-op., Box 354, State College 39762-----------	1/3,295	32,876	3,667	386	36,929	--	--	1	2	8	--	--	2	13	--	--
NEW HAMPSHIRE																
New Hampshire-Vermont Breeding Assn., P.O. Box 350, Concord 03302------	4,523	42,931	1/4,834	1/3,920	51,685	3	1	11	15	14	--	--	2	46	--	--
NEW YORK																
New York ABC, Inc., P.O. Box 518, Ithaca 14851---	28,437	491,620	62,812	1,943	556,375	12	12	25	124	27	--	--	14	214	--	--
NORTH CAROLINA																
N.C. Inst. Breeding Assn. Dept. of Animal Science, N.C. State Univ., Raleigh 27600-----------	19	1,425	10	200	1,635	--	--	--	15	--	--	--	--	15	--	--

TABLE 3.--Artificial-breeding organization bull studs, January 1, 1966 (con't.)

State, name, and location of studs	Herds serviced	Cows bred in 1965				Number and breed of bulls used									Inseminations of--	
		Dairy total	Dairy to beef	Beef to beef	Total	Ayrshire	Brown Swiss	Guernsey	Holstein	Jersey	Red Dane	Shorthorn	Beef	Total	Swine	Goats
OHIO																
Central Ohio Breeding Assn., 1224 Alton-Darby Rd., Columbus 43228	1/26,349	207,122	25,916	34,062	267,100	4	3	15	44	6	--	--	10	82	--	361
NOBA, Inc., Rt. 4, P.O. Box 1015, Tiffin 44883	15,019	184,403	30,549	11,463	226,415	--	3	11	34	16	--	1	5	70	--	18
PENNSYLVANIA																
Atlantic Breeders Co-op., Rt. 230 By-Pass, Box 254, Lancaster 17604	18,312	198,006	35,836	3,982	237,824	2	4	14	39	6	--	--	8	73	--	44
Northeastern Breeders Assn., R.D. 2, Tunkhannock 18657	13,125	188,642	30,106	700	219,448	6	3	14	60	9	--	--	9	101	--	--
Zimmerman Dairy Farm, Rt. 2, Lehighton 18235	1/615	8,000	---	---	8,000	--	--	--	3	--	--	--	--	3	--	--
PUERTO RICO																
Puerto Rico Artificial Breeding Assn., P.O. Box 958, Dorado 00646	943	26,541	---	---	26,541	--	3	--	8	--	--	--	--	11	--	--
TENNESSEE																
East Tenn. ABA, Rt. 10, Tipton Station Rd., Knoxville 37900	9,819	26,370	5,895	5,382	37,647	2	1	7	10	8	--	1	8	37	--	--
Tenn. Artificial Breeding Assn., Rt. 2, Granny White Pike, Brentwood 37027	5,006	30,439	1,890	2,110	34,439	--	3	3	5	5	--	--	3	19	--	--
West Tenn. ABA, Box 38, Yorkville 38389	943	6,719	650	3,031	10,400	--	--	--	6	5	--	--	12	23	--	--
UTAH																
Cache Valley Breeding Assn., 1950 N. Main, Logan 84321	8,485	70,312	4,538	19,740	94,590	--	1	2	21	1	--	1	19	45	--	--
VIRGINIA																
Va. Animal Breeders Assn., Inc., Rt. 4, P.O. Box 391, Rocky Mount 24151	7,606	63,745	8,169	3,933	75,847	1	--	6	15	4	--	--	4	30	--	10
WASHINGTON																
All West Breeders, P.O. Box 197, Burlington 98233	1/13,344	142,456	31,490	19,930	193,876	1	--	23	33	23	--	2	2	84	--	11
Carnation Farms Breeding Service, Wash. Unit, Carnation 98014	62	2,310	500	40	2,850	--	--	--	4	--	--	--	1	5	--	--

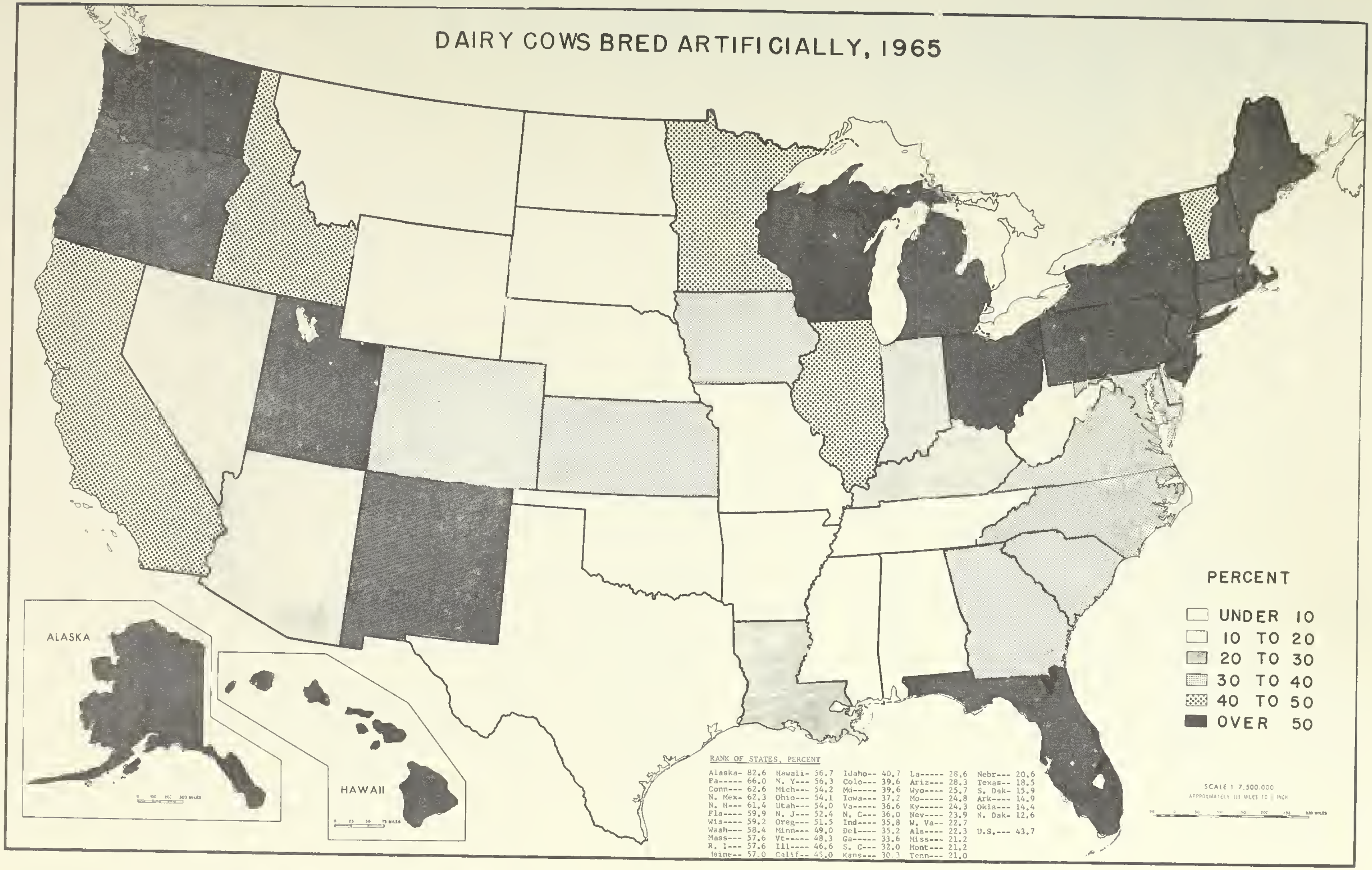
See footnotes at end of table.

TABLE 3.--Artificial-breeding organization bull studs, January 1, 1966 (con't.)

State, name, and location of studs	Herds serviced	Cows bred in 1965				Number and breed of bulls used									Insemina-tions of--	
		Dairy total	Dairy to beef	Beef to beef	Total	Ayr-shire	Brown Swiss	Guern-sey	Hol-stein	Jer-sey	Red Dane	Short-horn	Beef	Total	Swine	Goats
WISCONSIN																
American Breeders Service, Inc., De Forest 53532---------	1/110,988	1,158,409	187,523	96,910	1,442,842	3	5	7	184	9	--	2	38	3/248	--	--
Associated Breeding Service, Lena 54139-----	1,194	12,511	2,942	194	15,647	--	--	4	13	--	--	--	4	21	--	--
Badger Breeders Co-op., Rt. 2, P.O. Box 469, Shawano 54166-----------	20,823	347,104	49,722	3,879	400,705	--	6	11	32	2	--	--	5	56	34	--
Carnation Farms Breeding Service, Wis. Unit, Rt. 4, Watertown 53094------	4,097	103,453	1/16,355	1/5,959	125,767	3	3	3	24	5	--	2	--	40	--	--
East Central Breeders Assn. Co-op., 314 Beaver Dam St., P.O. Box 191, Waupun 53963------------	4,656	74,298	14,402	400	89,100	--	5	3	26	--	--	--	5	39	--	--
Tri-State Breeders Co-op. Westby 54667------------	24,283	391,693	58,313	7,063	457,069	--	1	13	57	3	--	2	16	92	2,043	--
AI activity by private studs and individuals, or studs not reported 4/	45	5,565	---	810	6,375	--	--	--	--	--	--	--	--	--	--	--
AI activity in custom-freezing 5/-------------	914	8,677	---	26,336	35,013	--	--	--	--	--	--	--	--	--	--	--
ALL-BEEF STUDS OR REPORTS, OR REPORTED BY NAAB																
Armour & Co. Beef Cattle Improvement Research, Box 9222, Chicago, Ill. 60690 6/----------------	---	---	---	95,000	95,000	--	--	--	--	--	--	--	30	30	--	--
Godding Cattle Research, Foraker, Okla. 74638----	8	---	---	2,251	2,251	--	--	--	--	--	--	--	20	20	--	--
International Beef Breeders, Inc., Box 29007, Denver, Colo. 80200 6/----------------	---	---	---	42,500	42,500	--	--	--	--	--	--	--	10	10	--	--
Wye Plantation, Queenstown, Md. 21658 6/	---	---	---	4,000	4,000	--	--	--	--	--	--	--	--	--	--	--
Additional services involving semen from ranchers' bulls 6/------	---	---	---	48,901	48,901	--	--	--	--	--	--	--	--	--	--	--
UNITED STATES-------------	591,859	6,301,178	963,657	615,147	7,879,982	51	101	293	1,238	231	4	31	439	2,388	3,569	587

1/ Data may be all or partially estimated when incomplete report was given.
2/ Includes 46 bulls in a young sire progeny testing program: 4 Guernsey, 37 Holstein, 3 Jersey, 1 Brown Swiss, 1 Milking Shorthorn.
3/ Includes 121 Holstein bulls in a young sire progeny testing program.
4/ AI breeding activity reported from: Georgia, 810 cows; Hawaii, 3,385 cows; Puerto Rico, 1,700 cows; Rhode Island, 480 cows. Total: 6,375 cows.
5/ Custom-freezing reported from: Jessup Breeders, 17,200; Colorado State University, 6,613; Midwest Genes, Inc., 11,200. Total: 35,013 services.

DAIRY COWS BRED ARTIFICIALLY, 1965



RANK OF STATES, PERCENT

Alaska-	82.6
Pa------	66.0
Conn---	62.6
N. Mex-	62.3
N. H---	61.4
Fla----	59.9
Wis----	59.2
Wash---	58.4
Mass---	57.6
R. I---	57.6
Maine--	57.0
Hawaii-	56.7
N. Y---	56.3
Mich---	54.2
Ohio---	54.1
Utah---	54.0
N. J---	52.4
Oreg---	51.5
Minn---	49.0
Vt-----	48.3
Ill----	46.6
Calif--	45.0
Idaho--	40.7
Colo---	39.6
Md-----	39.6
Iowa---	37.2
Va-----	36.6
N. C---	36.0
Ind----	35.8
Del----	35.2
Ga-----	33.6
S. C---	32.0
Kans---	30.3
La-----	28.6
Ariz---	28.3
Wyo----	25.7
Mo-----	24.8
Ky-----	24.3
Nev----	23.9
W. Va--	22.7
Ala----	22.3
Miss---	21.2
Mont---	21.2
Tenn---	21.0
Nebr---	20.6
Texas--	18.5
S. Dak-	15.9
Ark----	14.9
Okla---	14.4
N. Dak-	12.6
U.S.---	43.7

EXTENSION SERVICE OFFICIALS WORKING WITH DAIRY BREEDING ASSOCIATIONS IN THE STATES

Ala------ R. S. Jones, Jr., Dairy Science Dept., Auburn University, Auburn 36830.
Alaska--- W. J. Sweetman, Experiment Station Research Staff, University of Alaska, Palmer 99645.

Ariz----- W. R. Van Sant, Dept. of Dairy Science, University of Arizona, Tucson 85721.
Ark------ L. Ratcliff, Animal Industry & Veterinary Science Dept., University of Arkansas, Little Rock 72203.

Calif---- C. L. Pelissier, Extension Service, University of California, Davis 95616.
Colo----- D. C. Jordan, Animal Science Dept., Colorado State University, Fort Collins 80521.
Conn----- R. H. Benson, Animal Industries Dept., University of Connecticut, Storrs 06268.
Del------ W. R. Hesseltine, Animal & Poultry Science Dept., University of Delaware, Newark 19711.

Fla------ C. W. Reaves, Extension Dairy Section, University of Florida, Gainesville 32603.
Ga------- J. N. Maddux, Animal Industry Division, University of Georgia, Athens 30601.
Hawaii--- H. R. Donoho, Animal Science Dept., University of Hawaii, Honolulu 96822.
Idaho---- G. W. Cleveland, Dairy Science Dept., University of Idaho, Boise 83701.
Ill------ J. G. Cash, Dairy Science Dept., University of Illinois, Urbana 61803.
Ind------ N. J. Moeller, Dept. of Animal Sciences, Purdue University, Lafayette 47907.
Iowa----- B. R. Eastwood, Animal & Dairy Science Dept., Iowa State University, Ames 50010.
Kans----- R. Bonewitz, Dairy Science Dept., Kansas State University, Manhattan 66504.
Ky------- J. C. Wilk, Dairy Science Dept., University of Kentucky, Lexington 40506.
La------- H. W. Anderson, La. Agr. Extension Service, Louisiana State University, Baton Rouge 70803.

Maine---- R. A. Corbett, Animal Science Dept., University of Maine, Orono 04473.
Md------- H. T. Heaps, Manager, DHIC, University of Maryland, College Park 20742.
Mass----- S. N. Gaunt, Veterinary & Animal Sciences Dept., University of Massachusetts, Amherst 01003.

Mich----- C. E. Meadows, Dairy Genetics & Breeding, Michigan State University, East Lansing 48823.

Minn----- R. W. Wayne, Dairy Husbandry Dept., University of Minnesota, St. Paul 55101.
Miss----- G. B. Crain, Dairy Science Dept., Mississippi State University, State College 39762.

Mo------- A. G. Lane, Dairy Husbandry Dept., University of Missouri, Columbia 65202.
Mont----- E. J. Peace, Dept. of Animal Science & Range Management, Montana State University, Bozeman 59715.

Nebr----- C. W. Nibler, Dairy Science Dept., University of Nebraska, Lincoln 68503.
Nev------ H. P. Adams, Animal Science Dept., University of Nevada, Reno 89507.
N. H----- H. Boynton, Animal Science Dept., University of New Hampshire, Durham 03824.
N. J----- E. T. Oleskie, Animal Science Dept., Rutgers University, New Brunswick 08903.
N. Mex--- J. B. Ells, Dairy Dept., New Mexico State University, University Park 88070.
N. Y----- R. Albrectsen, Animal Husbandry Dept., Cornell University, Ithaca 14850.
N. C----- F. D. Sargent, Animal Science Dept., North Carolina State University, Raleigh 27607.

N. Dak--- G. R. Fisher, Dairy Husbandry Dept., North Dakota State University, Fargo 58103.
Ohio----- C. D. McGrew, Dairy Science Dept., Ohio State University, Columbus 43210.
Okla----- C. H. Burton, Dept. of Dairying, Oklahoma State University, Stillwater 74075.
Oreg----- H. P. Ewalt, Animal Science Dept., Oregon State University, Corvallis 97331.
Pa------- L. W. Specht, Dairy Science Dept., Pennsylvania State University, University Park 16802.

P. R----- M. J. Ortiz, Animal Husbandry Dept., University of Puerto Rico, Rio Piedras 00931.
R. I----- J. W. Atwood, Dairy Science Dept., University of Rhode Island, Kingston 02881.
S. C----- C. H. Lomas, Dairy Science Dept., Clemson University, Clemson 29631.
S. Dak--- E. Kurtz, Dairy Science Dept., South Dakota State University, Brookings 57007.
Tenn----- C. K. Chappell, Dairy Dept., University of Tennessee, Knoxville 37919.
Tex------ A. M. Meekma, Dairy Science Dept., Texas A & M University, College Station 77841.
Utah----- J. J. Barnard, Dairy Industry Dept., Utah State University, Logan 84321.
Vt------- R. Fitzsimmons, Animal & Dairy Science Dept., University of Vermont, Burlington 05401.

Va------- V. L. Baldwin, Dairy Science Dept., Virginia Polytechnic Institute, Blacksburg 24061.

Wash----- B. F. Kelso, Animal Sciences Dept., Washington State University, Pullman 99163.
W. Va---- R. O. Kelley, Animal Industry & Veterinary Science Dept., West Virginia University, Morgantown 26506.

Wis------ E. E. Starkey, Dairy Science Dept., University of Wisconsin, Madison 53706.
Wyo------ I. W. Slater, Division of Animal Science, University of Wyoming, Laramie 82071.

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AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

ARS-44-178
Dairy-Herd-Improvement Letter (Vol. 42, No. 4)

May 1966

REPORT OF THE FIRST MEETING OF THE NATIONAL DHIA COORDINATING GROUP

The first meeting of the National DHIA Coordinating Group was held in Washington, D. C., February 23-24, 1966. All thirteen representatives were in attendance.

The broad objectives of the Coordinating Group are to bring about more complete and effective integration of the operational and administrative aspects of the National Cooperative Dairy Herd Improvement Program at the National, Regional, State, and County levels. The Group provides direct representation to segments of the dairy industry that depend heavily upon the use of the data produced. In addition, it provides a strong base for the formulation of policy, rules, and regulations and for administering their effective coordination and application to the DHIA Program.

Much of the first meeting was devoted to the subject of how the Coordinating Group can best act in strengthening DHIA. The deliberations included discussions of such matters as: (1) defining the functions of the Coordinating Group and its relationship to other interested organizations; (2) outlining its operational procedure; and (3) re-evaluating the existing Memorandum of Understanding that outlines the individual responsibilities of the Federal Extension Service, the Agricultural Research Service, and the State Extension Services, including County Agricultural Agents, and local associations. The desirability of strengthening 18 active State DHIA Associations, the recently formed National DHIA, Inc., and the need for more statewide associations were noted. Some of

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these organizations are or can effectively serve in promoting the uniform enforcement of rules and in conducting business-oriented service activities.

The Coordinating Group discussed ways to make critically needed research results available on the adequacies of existing and new weighing and sampling devices. The Group agreed to establish a technical subgroup composed of research and dairy extension personnel to develop interest and obtain research results in this important area. The technical subgroup will report their findings and recommendations to the Coordinating Group for evaluation.

In recognizing the need for greater uniformity in the use and enforcement of DHIA rules, the Coordinating Group requested the Dairy Records Committee of the American Dairy Science Association to thoroughly review the existing DHIA rules. The ultimate need is for standards that are practical, realistic, and enforceable under modern production systems and that will provide authentic, accurate production records and services the industry needs. The Dairy Records Committee will report their findings and recommendations to the Coordinating Group.

Steps were taken that should lead to redefining the responsibilities of cooperating agencies and groups involved in the overall conduct of dairy recordkeeping programs. The chairmen of the four regional extension subgroups were asked to work with their respective extension dairymen, extension directors, and State and local associations, to determine what is expected of local and State organizations in the conduct of DHIA recordkeeping. Attention will be given to the roles involved in promotion, rule enforcement, business activity, personnel management, educational activities, and other related areas of work. The recommendations of the four regional subgroup chairmen, each of whom is a member of the Coordinating Group, will be consolidated into a single recommendation and reported to the Coordinating Group at a future meeting.

The responsibility and authority that the Coordinating Group may assume was outlined and discussed, largely in terms of coordination, evaluation, leadership, and influence. It was felt that the influence of the Coordinating Group could be used effectively to bring about improvements in the troublesome areas as rule enforcement at local levels so that direct enforcement action by individual Extension Specialist would not be necessary. It was the hope of the Group that improvement could be effectively accomplished through broad industry support and representation in the Coordinating Group and through the Group's effort in systematically and thoroughly evaluating problem areas such as weighing and sampling devices and the establishment and enforcement of rules. The Coordinating Group will call upon competent individuals and technical subgroups for assistance in the future.

In its first meeting, the Coordinating Group recognized that DHIA is and has been a strong and effective recordkeeping program. This belief is supported by the following facts: (1) Participation in DHIA has doubled since 1954 and currently approaches three million cows; (2) almost 19 percent of all milking cows are enrolled in the three plans of recordkeeping; (3) cows on Standard DHIA exceed all dairy cows in milk yield by more than 4,200 pounds per cow annually; (4) the records available for research and sire evaluation have tripled since 1954 and numbered 1.75 million in 1965; (5) approximately 38 percent of all cows enrolled on Standard DHIA are registered in breed society herd books; (6) the sire evaluation work done by the U.S. Department of Agriculture is on a systematic,complete, and up-to-date basis and provides the industry with the basic tools necessary for genetic progress in production traits; (7) the cow evaluation program started in 1964 by the U.S. Department of Agriculture should accelerate the rate of genetic gain; and (8) the National DHIA farmers organization was first formed in 1965.

The next meeting for the National DHIA Coordinating Group was set for May 16-17, 1966, in Washington, D. C.

Members in attendance at the first meeting were:

L. H. Davis (Chairman) Administrator, Federal Extension Service, USDA
E. L. Corley (Secretary) Chief, Dairy Cattle Research Branch, ARS, USDA
F. H. Baker, Coordinator, Animal Science Program, FES, USDA
John J. Barnard, Dairy Extension Specialist, Utah State University
Craig Beane, President, National DHIA, Inc.
Charles E. Bell, Director, Division of Agricultural Science, Technology and Management, FES (Assisted L. H. Davis)

H. C. Gilmore, Dairy Extension Specialist, Pennsylvania State University
G. W. Harpestad, Dairy Extension Specialist, University of Illinois
H. A. Herman, Executive Secretary, National Association of Animal Breeders
R. E. Hodgson, Director, Animal Husbandry Research Division, ARS, USDA
S. W. Hoitt, Director, Extension Service, University of New Hampshire
D. N. Putnam, Dairy Extension Specialist, Pennsylvania State University
R. H. Rumler, Executive Secretary, Holstein-Friesian Association
M. E. Senger, Dairy Extension Specialist, North Carolina State University

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Dairy-Herd-Improvement Letter
ARS-44-181
(Vol. 42, No. 5)

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June 1966

RESUMÉ OF 1965-66 [1]

Genetic Appraisal of Sires

Quarterly sire evaluations were continued during 1965-66. These genetic appraisals were based on evaluations of 4,091 AI sires and of 13,634 non-AI sires. Collectively, the appraisals resulted in 53,848 individual sire records (DHIA Form 1202's) for the cooperating States and were based on 1,760,503 lactation records reported since the last evaluation in 1964-65. A further summary of the quarterly sire evaluations is shown in table 1.

Genetic Appraisal of Cows

The semiannual DHIA Cow Performance Index Lists (ARS-44-170 and ARS-44-180) were issued in January and July 1966, respectively. This indexing procedure is used to evaluate and recognize genetically superior cows. A total of 13,540 cows was evaluated after about 580,000 potential qualifiers were screened. A summary of minimum milk index levels and number of cows evaluated by breed follows:

---

[1] Double years refer to a fiscal year--the period that begins July 1 in the year stated first and ends June 30 in the year stated last. Unless stated otherwise, single years refer to a calendar year.

Issued July 1966

Breed	Minimum milk index level 1/	Cow evaluation listed in— ARS-44-170	ARS-44-180
	Pounds	Number	Number
Ayrshire-----------	1,550	277	328
Guernsey-----------	1,200	994	1,286
Holstein-----------	1,725	5,699	3,562
Jersey-------------	1,175	391	475
Brown Swiss--------	1,600	233	264
Milking Shorthorn--	1,350	14	17
Total----------------------------		7,608	5,932

1/ Index equated to genetic superiority over herdmates. The average milk index value of the 13,540 selected cows was greater than 2,000 pounds.

Cow Production Levels

The 1964-65 production average for cows on Standard DHIA testing was 11,976 pounds of milk and 457 pounds of fat. This was an increase of 291 pounds of milk and 10 pounds of fat per cow over 1963-64. The superiority of DHIA cows over non-DHIA cows increased to 4,708 pounds - 190 pounds more than a year ago. Owner-Sampler cows averaged 11,402 pounds of milk and 423 pounds of fat.

Participation in DHIA Recordkeeping Plans

On January 1, 1966, the combined DHIA recordkeeping program included 66,298 herds and 2,955,387 cows. The animals in the recordkeeping program are 19.1 percent of the nation's dairy cow population. This compares with 18.4 percent in 1965. However, herds and cows decreased by 1,610 and 7,170, respectively, compared with records of the previous year. Of the total on DHIA recordkeeping, 38,879 herds and 2,058,592 cows were on the Standard plan; 26,259 herds and 839,838 cows were on the Owner-Sampler plan; and 1,160 herds and 56,957 cows were on the Weigh-a-Day-a-Month plan.

Cow Indexes

The progeny of both AI and non-AI bulls were included in the two cow indexes (ARS-44-170 and ARS-44-180) computed during the year. Daughters and non-AI bulls were evaluated solely on the basis of their own performance versus that of herdmates. In the case of AI progeny, both performance of daughters versus that of herdmates and the performance of the sire were included in the index.

The name and address of the herd owner are included in the DHIA Cow Performance Index List if the cow was from a herd whose records were machine processed.

6,926 SIRES SUMMARIZED IN FEBRUARY 1966

A total of 5,699 non-AI and 1,227 AI sires were evaluated in February 1966. A summary of the 18,770 sire records made available to the cooperating States is shown in table 2.

2,129 SIRES SUMMARIZED IN MAY 1966

A total of 1,240 non-AI and 889 AI sires were evaluated in May 1966. A summary of the 9,268 sire records made available to the cooperating States is shown in table 3.

271,828 COWS SUMMARIZED IN MAY 1966

A total of 14,946 non-AI progeny and 256,882 AI progeny were evaluated in May 1966. Included in the evaluation were 347,676 lactation records received and processed since the previous summary.

1964 BREED-SEASON LACTATION AVERAGES

Breed-season lactation averages for DHIA cows that calved in 1964 are shown in table 4. The average of all available and usable 1,434,253 lactation records was 12,633 pounds of milk and 481 pounds of fat. Grade cows comprise 59 percent of the total. The production represents an increase of 307 pounds of milk and 10 pounds of fat over 1963. The usual and expected seasonal trends were evident.

Lactation averages grouped by breed and by registered and nonregistered categories are shown in table 5. By weighting the within-breed milk yield differences between registered and grade cows by the number of records reported in the respective breed, an overall registered breed superiority of 951 pounds of milk and 42 pounds of fat can be obtained. However, it should be recognized that such gross differences, which are not on a within-herd basis, do not necessarily reflect the relative producing ability of grade and registered cows under comparable environment.

TABLE 1.--Sire summaries made in 1965-66

Evaluation	AI		Non-AI		Summaries to States	Records added since previous run
	Sires	Progeny	Sires	Progeny		
	Number	Number	Number	Number	Number	Number
August 1965	994	301,351	3,990	57,761	14,917	366,618
November 1965	981	225,583	2,705	24,381	10,893	626,772
February 1966	1,227	310,998	5,699	90,056	18,770	419,437
May 1966	889	256,882	1,240	14,946	9,268	347,676
Overall	4,091	1,094,814	13,634	187,144	53,848	1,760,503

TABLE 2.--Number of sire records summarized February 1966, by State and breed

State	Ayrshire	Guernsey	Holstein	Jersey	Brown Swiss	Shorthorn	Red Dane	Other	Red Poll	Total
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
Maine	20	39	168	46	9	--	--	--	--	282
New Hampshire	33	28	156	52	13	1	--	--	--	283
Vermont	44	53	332	105	25	1	--	--	--	560
Massachusetts	42	54	265	64	18	1	--	--	--	444
Rhode Island	18	20	76	8	--	--	--	--	--	122
Connecticut	29	96	257	36	16	--	--	--	--	434
New York	71	135	894	128	43	2	1	--	--	1,274
New Jersey	4	82	251	25	28	--	--	--	--	390
Pennsylvania	65	252	774	87	42	11	--	1	--	1,232
Ohio	35	156	479	152	71	7	--	--	--	900
Indiana	18	145	353	79	47	15	2	--	1	660
Illinois	29	120	398	60	63	8	--	--	--	678
Michigan	18	88	491	67	37	6	3	--	--	710
Wisconsin	16	192	795	69	62	12	--	--	2	1,148
Minnesota	34	107	552	64	54	20	--	--	--	831
Iowa	35	94	464	77	71	24	--	--	--	765
Missouri	--	59	233	58	12	13	--	--	--	375
North Dakota	--	14	116	2	15	2	--	--	--	149
South Dakota	17	9	138	8	12	--	--	--	--	184
Nebraska	5	41	172	26	16	9	--	--	--	269
Kansas	27	52	259	45	34	7	--	--	--	424
Delaware	7	17	93	10	5	--	--	--	--	132
Maryland	20	85	269	31	25	2	--	--	--	432
Virginia	21	110	314	35	29	--	--	--	--	509
West Virginia	13	17	123	21	2	--	--	--	--	176
North Carolina	12	92	214	79	14	--	--	--	--	411
South Carolina	4	107	123	73	21	1	--	--	--	329
Georgia	18	44	171	70	29	--	--	--	--	332
Florida	8	97	109	68	19	--	--	--	--	301
Kentucky	5	47	214	52	18	--	--	--	--	336
Tennessee	25	77	162	97	33	4	--	--	--	398
Alabama	10	41	95	67	14	--	--	--	--	227
Mississippi	14	55	70	68	13	--	--	--	--	220
Arkansas	2	23	85	18	2	5	--	--	--	135
Louisiana	--	54	49	23	6	--	--	--	--	132
Oklahoma	14	38	127	26	8	8	--	--	--	221
Texas	7	35	172	81	15	2	--	--	--	312
Montana	2	7	43	7	6	--	--	--	--	65
Idaho	7	43	152	34	7	--	--	--	--	243
Wyoming	--	4	19	--	--	--	--	--	--	23
Colorado	3	43	128	18	18	2	--	--	--	212
New Mexico	--	21	65	12	--	--	--	--	--	98
Arizona	--	26	105	9	1	--	--	--	--	141
Utah	4	25	152	20	--	--	--	--	--	201
Nevada	--	--	24	16	2	--	--	--	--	42
Washington	12	63	139	46	5	4	--	--	--	269
Oregon	4	43	87	56	9	2	--	--	--	201
California	14	42	357	82	23	--	--	--	--	518
Puerto Rico	--	--	8	--	--	--	--	--	--	8
Hawaii	--	--	12	--	--	--	--	--	--	12
Alaska	--	--	6	--	14	--	--	--	--	20
Total sire records sent to States										18,770
Sire records summarized	247	1,219	4,186	898	292	77	3	1	3	6,926

TABLE 3.--Number of sire records summarized May 1966, by State and breed

State	Ayrshire	Guernsey	Holstein	Jersey	Brown Swiss	Shorthorn	Red Dane	Other	Red Poll	Total
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
Maine	9	28	85	26	5	--	--	--	--	153
New Hampshire	17	20	96	27	8	1	--	--	--	169
Vermont	19	37	167	53	18	--	--	--	--	294
Massachusetts	18	35	136	30	11	--	--	--	--	230
Rhode Island	12	17	51	3	--	--	--	--	--	83
Connecticut	13	39	130	16	11	--	--	--	--	209
New York	31	64	338	62	27	--	1	--	--	523
New Jersey	4	42	139	19	22	--	--	--	--	226
Pennsylvania	29	102	326	39	24	1	--	--	--	521
Ohio	18	56	197	46	29	2	--	--	--	348
Indiana	13	55	157	27	23	6	2	--	--	283
Illinois	18	59	205	31	25	3	--	--	--	341
Michigan	11	41	186	23	16	3	3	--	--	283
Wisconsin	11	79	304	35	32	6	--	--	--	467
Minnesota	19	43	243	30	24	7	--	--	--	366
Iowa	16	34	235	39	30	7	--	--	--	361
Missouri	--	27	117	18	5	4	--	--	--	171
North Dakota	--	8	65	4	9	2	--	--	--	88
South Dakota	11	6	84	6	5	--	--	--	--	112
Nebraska	4	24	106	14	15	3	--	--	--	166
Kansas	14	24	121	18	21	2	--	--	--	200
Delaware	6	12	57	7	3	--	--	--	--	85
Maryland	11	47	170	21	19	1	--	--	--	269
Virginia	12	50	137	20	20	--	--	--	--	239
West Virginia	11	13	85	13	1	--	--	--	--	123
North Carolina	10	38	133	32	10	--	--	--	--	223
South Carolina	3	41	76	38	10	--	--	--	--	168
Georgia	11	18	84	29	13	--	--	--	--	155
Florida	9	40	64	31	13	--	--	--	--	157
Kentucky	7	22	121	18	12	--	--	--	--	180
Tennessee	15	43	80	25	18	2	--	--	--	183
Alabama	6	17	56	23	7	--	--	--	--	109
Mississippi	10	33	43	26	7	--	--	--	--	119
Arkansas	2	10	59	7	2	3	--	--	--	83
Louisiana	--	27	37	10	5	--	--	--	--	79
Oklahoma	10	17	67	14	4	6	--	--	--	118
Texas	8	20	111	35	12	--	--	--	--	186
Montana	2	5	21	8	4	--	--	--	--	40
Idaho	7	26	93	21	6	1	--	--	--	154
Wyoming	--	5	14	--	--	--	--	--	--	19
Colorado	3	29	89	7	7	--	--	--	--	135
New Mexico	--	10	42	8	--	--	--	--	--	60
Arizona	--	21	60	4	1	--	--	--	--	86
Utah	4	17	80	17	--	--	--	--	--	118
Nevada	--	--	18	15	2	--	--	--	--	35
Washington	11	36	81	20	5	--	--	--	--	153
Oregon	3	29	59	22	4	--	--	--	--	117
California	13	29	179	22	12	--	--	--	--	255
Puerto Rico	--	--	7	--	--	--	--	--	--	7
Hawaii	--	--	7	--	--	--	--	--	--	7
Alaska	--	--	3	--	9	--	--	--	--	12
Total sire records sent to States										9,268
Sire records summarized	86	356	1,284	282	93	25	3	--	--	2,129

TABLE 4.--Breed-season DHIA lactation averages for calvings in 1964

Calving month	Records		Average production		
	Registered	Total	Milk	Fat	
	Percent	Number	Pounds	Percent	Pounds
AYRSHIRE					
January--------	80	2,050	10,980	4.02	441
February-------		1,851	10,991	4.00	440
March----------		[illegible]	10,857	3.99	433
April----------			10,655	4.02	428
May------------			[illegible]	3.99	423
June-----------				3.99	412
July-----------					
August---------					
September------					
October--------					
November-------					
December-------					
Overall--------					
GUERNSEY					
January--------					
February-------					
March----------					
April----------					
May------------					
June-----------					
July-----------					
August---------					
September------					
October--------					
November-------					
December-------					
Overall--------					
HOLSTEIN					
January--------					
February-------					
March----------					
April----------					
May------------					
June-----------					
July-----------					
August---------					
September------					
October--------					
November-------					
December-------					
Overall--------					
JERSEY					
January--------					
February-------					
March----------	[illegible]	7,086	8,874	5.05	448
April----------	56	5,714	8,761	5.03	441
May------------	55	5,113	8,556	5.00	428
June-----------	53	5,590	8,428	5.04	425
July-----------	58	8,442	8,062	5.09	410
August---------	56	11,487	7,933	5.12	406
September------	56	11,571	8,098	5.17	419
October--------	57	11,196	8,434	5.18	437
November-------	57	10,446	8,652	5.14	445
December-------	56	9,646	8,855	5.09	451
Overall--------	57	102,370	8,486	5.10	433

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TABLE 3.--Number of sire records summarized May 1966, by State and breed

State	Ayrshire	Guernsey	Holstein	Jersey	Brown Swiss	Shorthorn	Red Dane	Other	Red Poll	Total
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
Maine----------------	9	28	85	26	5	--	--	--	--	153
New Hampshire--------	17	20	96	27	8	1	--	--	[illegible]	169
Vermont--------------	19	37	167	53	18	--	--	--	[illegible]	94
Massachusetts--------	18	35	136	30	11	--	[illegible]	[illegible]	[illegible]	30
Rhode Island---------	12	17	51	3	--	[illegible]	[illegible]	[illegible]	[illegible]	83
Connecticut----------	13	39	130	16	11	[illegible]	[illegible]	[illegible]	[illegible]	09
New York-------------	31	64	338	[illegible]	27	[illegible]	[illegible]	[illegible]	[illegible]	23
New Jersey-----------	4	42	139	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	26
Pennsylvania---------	29	102	326	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21
Ohio-----------------	18	56	197	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	348
Indiana--------------	13	55	157	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	283
Illinois-------------	18	59	205	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	341
Michigan-------------	11	41	186	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	283
Wisconsin------------	11	79	304	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	467
Minnesota------------	19	43	243	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	366
Iowa-----------------	16	34	235	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	361
Missouri-------------	--	27	117	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	171
North Dakota---------	--	8	65	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	88
South Dakota---------	11	6	84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	112
Nebraska-------------	4	24	106	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	166
Kansas---------------	14	24	121	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	200
Delaware-------------	6	12	57	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	85
Maryland-------------	11	47	170	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	269
Virginia-------------	12	50	137	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	239
West Virginia--------	11	13	85	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	123
North Carolina-------	10	38	13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	223
South Carolina-------	3	41	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	168
Georgia--------------	11	18	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	155
Florida--------------	9	40	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	157
Kentucky-------------	7	22	12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	180
Tennessee------------	15	43	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	183
Alabama--------------	6	17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	109
Mississippi----------	10	33	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	119
Arkansas-------------	2	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	83
Louisiana------------	--	27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	79
Oklahoma-------------	10	17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	118
Texas----------------	8	20	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	186
Montana--------------	2	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40
Idaho----------------	7	26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	154
Wyoming--------------	--	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19
Colorado-------------	3	29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	135
New Mexico-----------	--	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	60
Arizona--------------	--	21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	86
Utah-----------------	4	17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	118
Nevada---------------	--	--	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	35
Washington-----------	11	36	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	153
Oregon---------------	3	29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	117
California-----------	13	29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	255
Puerto Rico----------	--	--	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7
Hawaii---------------	--	--	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7
Alaska---------------	--	--	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12
Total sire records sent to States-----			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9,268
Sire records summarized---------	86	356	1,264	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2,129

TABLE 4.--Breed-season DHIA lactation averages for calvings in 1964

Calving month	Records		Average production		
	Registered	Total	Milk	Fat	
	Percent	Number	Pounds	Percent	Pounds
AYRSHIRE					
January--------	80	2,050	10,980	4.02	441
February-------	79	1,851	10,991	4.00	440
March----------	77	2,115	10,857	3.99	433
April----------	74	1,478	10,655	4.02	428
May------------	77	1,265	10,609	3.99	423
June-----------	76	1,385	10,330	3.99	412
July-----------	77	2,239	10,024	4.03	404
August---------	77	2,878	10,142	4.06	412
September------	78	3,038	10,442	4.10	428
October--------	78	2,853	10,828	4.09	443
November-------	77	2,397	10,983	4.07	447
December-------	76	2,262	11,010	4.03	444
Overall--------	77	25,811	10,645	4.04	430
GUERNSEY					
January--------	68	11,568	9,541	4.73	451
February-------	66	10,065	9,490	4.71	447
March----------	67	10,027	9,524	4.69	447
April----------	66	8,362	9,373	4.71	441
May------------	66	7,607	9,185	4.69	431
June-----------	66	7,848	8,954	4.71	422
July-----------	68	10,585	8,726	4.78	417
August---------	64	13,713	8,632	4.82	416
September------	64	14,148	8,886	4.85	431
October--------	63	13,584	9,266	4.83	448
November-------	66	12,811	9,524	4.79	456
December-------	64	11,733	9,570	4.74	454
Overall--------	65	132,051	9,213	4.77	439
HOLSTEIN					
January--------	38	88,203	13,735	3.63	498
February-------	36	74,975	13,666	3.62	495
March----------	35	74,907	13,640	3.62	494
April----------	34	59,191	13,590	3.61	490
May------------	34	55,065	13,410	3.60	483
June-----------	33	62,897	13,161	3.62	477
July-----------	35	92,143	12,870	3.64	469
August---------	33	127,658	12,890	3.66	472
September------	34	135,496	13,324	3.68	490
October--------	34	136,083	13,719	3.68	505
November-------	35	123,451	13,865	3.66	508
December-------	34	110,137	13,850	3.64	504
Overall--------	35	1,140,206	13,479	3.65	492
JERSEY					
January--------	61	8,557	8,802	5.08	447
February-------	58	7,522	8,843	5.05	447
March----------	58	7,086	8,874	5.05	448
April----------	56	5,714	8,761	5.03	441
May------------	55	5,113	8,556	5.00	428
June-----------	53	5,590	8,428	5.04	425
July-----------	58	8,442	8,062	5.09	410
August---------	56	11,487	7,933	5.12	406
September------	56	11,571	8,098	5.17	419
October--------	57	11,196	8,434	5.18	437
November-------	57	10,446	8,652	5.14	445
December-------	56	9,646	8,855	5.09	451
Overall--------	57	102,370	8,486	5.10	433

TABLE 4.--Breed-season DHIA lactation averages for calvings in 1964 (Con't.)

Calving month	Records		Average production		
	Registered	Total	Milk	Fat	
	Percent	Number	Pounds	Percent	Pounds
BROWN SWISS					
January--------	69	2,586	12,228	4.05	495
February-------	71	2,209	12,308	4.03	496
March----------	69	2,392	12,109	4.03	488
April----------	71	1,980	11,935	4.02	480
May------------	67	1,749	11,705	4.00	468
June-----------	66	1,868	11,535	4.03	465
July-----------	71	2,596	11,206	4.10	459
August---------	65	2,925	11,091	4.12	457
September------	66	2,898	11,532	4.14	478
October--------	65	2,850	11,856	4.14	491
November-------	66	3,031	12,132	4.13	501
December-------	66	2,504	12,200	4.09	499
Overall--------	68	29,588	11,812	4.08	482
MILKING SHORTHORN					
January--------	82	347	9,289	3.74	347
February-------	81	305	9,787	3.69	361
March----------	86	319	9,839	3.71	365
April----------	81	220	9,745	3.70	361
May------------	86	191	9,285	3.67	341
June-----------	80	190	9,429	3.73	352
July-----------	85	310	8,790	3.71	326
August---------	83	374	8,707	3.76	327
September------	82	403	8,901	3.79	337
October--------	82	456	9,243	3.80	351
November-------	84	379	9,663	3.80	367
December-------	80	322	9,550	3.78	361
Overall--------	83	3,816	9,323	3.74	349
RED DANE					
January--------	--	13	11,799	3.83	452
February-------	--	9	11,927	3.84	458
March----------	--	30	12,237	4.00	489
April----------	--	12	11,718	3.86	452
May------------	--	7	11,603	4.08	473
June-----------	--	12	11,453	4.09	468
July-----------	--	42	10,717	3.94	422
August---------	--	45	10,547	3.92	413
September------	--	34	11,046	4.10	453
October--------	--	32	12,375	4.02	497
November-------	--	25	12,499	3.97	496
December-------	--	10	12,953	3.78	490
Overall--------	--	271	11,533	3.96	457
RED POLL					
January--------	84	25	8,631	3.97	343
February-------	75	12	9,167	3.79	347
March----------	84	19	8,128	4.01	326
April----------	67	3	8,117	3.97	322
May------------	60	10	9,004	3.96	357
June-----------	80	5	7,264	3.91	284
July-----------	50	2	5,800	3.97	230
August---------	46	13	7,966	3.92	312
September------	57	7	7,339	4.05	297
October--------	88	8	6,770	3.93	266
November-------	90	20	6,695	4.17	279
December-------	75	16	8,051	4.17	336
Overall--------	76	140	7,959	4.00	318
United States--	41	1,434,253	12,633	3.81	481

TABLE 5.--Breed-season DHIA lactation averages for calvings in 1964, by breed—registered and non-registered

Breed	Registered				Non-registered				All			
	Records	Milk	Fat		Records	Milk	Fat		Records	Milk	Fat	
	Number	Pounds	Percent	Pounds	Number	Pounds	Percent	Pounds	Number	Pounds	Percent	Pounds
Ayrshire----------	19,954	10,800	4.1	438	5,857	10,118	4.0	404	25,811	10,645	4.0	430
Guernsey----------	86,436	9,419	4.8	454	45,615	8,822	4.6	410	132,051	9,213	4.8	439
Holstein----------	393,525	14,181	3.7	520	746,681	13,109	3.6	476	1,140,206	13,479	3.7	492
Jersey------------	58,149	8,617	5.2	447	44,221	8,314	5.0	415	102,370	8,486	5.1	433
Brown Swiss-------	20,002	11,988	4.1	492	9,586	11,444	4.0	461	29,588	11,812	4.1	482
Milking Shorthorn-	3,153	9,217	3.7	344	663	9,826	3.8	374	3,816	9,323	3.7	349
Red Dane----------	------	------	---	---	271	11,533	4.0	457	271	11,533	4.0	457
Red Poll----------	106	7,650	4.0	305	34	8,923	4.0	361	140	7,959	4.0	318
United States-----	581,325	12,697	3.9	498	852,928	12,589	3.7	469	1,434,253	12,633	3.8	481

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RECORD BOOK
A plan for every size herd
STANDARD DHIA
OWNER SAMPLER
WEIGH-A-DAY-A-MONTH
AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

Dairy-Herd-Improvement Letter
ARS-44-183
(Vol. 42, No. 6)

July 1966

STANDARD DHIA COWS EXCEED THE 12,000-POUND LEVEL OF MILK PRODUCTION

In 1965-66,[1] DHIA cows on Standard test produced an average of 12,127 pounds of milk and 462 pounds of butterfat. This record was made by 1,852,533 cows in 34,886 herds that averaged 53.1 cows per herd. It is an increase of 151 pounds of milk, 5 pounds of butterfat, and 1.9 cows per herd over 1964-65.

STANDARD DHIA COWS EXCEED ALL OTHER COWS BY 4,668 POUNDS OF MILK

The importance of DHIA recordkeeping continues to be increasingly evident. In 1965-66, Standard DHIA cows were superior in milk yield to all other cows by 63 percent, or 4,668 pounds. With milk in Standard DHIA herds valued at $4.70 per hundredweight, this superiority amounts to a yearly gross income advantage of $219 per cow or $10,950 for a 50-cow herd.

During the 3-year period since 1963, yearly increases in milk yield per cow have been 280 pounds in Standard DHIA and 196 pounds for all other cows. Thus, in addition to the 4,668-pound superiority in milk yield in 1965-66, the rate of increase has been 43 percent more rapid for Standard DHIA cows than for other cows since 1963. These statistics clearly

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[1] Double years refer to a testing year--the period that begins May 1 in the year stated first and ends April 30 in the year stated last. Unless stated otherwise, single years refer to a calendar year.

Issued September 1966

demonstrate the importance and results of participating in DHIA recordkeeping. A summary of the production performance of cows in Standard DHIA and all other herds in the United States is shown in table 1.

STANDARD DHIA SUMMARIES 1965-66

Table 2 is a 10-year summary of the Standard DHIA cow-year averages for herds reporting complete information. In 1965-66, 1,260,621 cows in 28,013 herds with complete reports averaged 11,885 pounds of milk and 453 pounds of butterfat. They were fed an average of 4,500 pounds of concentrate, 10,800 pounds of succulent forage, and 3,600 pounds of dry forage. They produced milk valued at $559 ($4.70 per cwt.), were fed at an estimated cost of $256, and returned an estimated $303 over feed cost. A summary of the 10-year change is also shown in table 2.

Summaries of DHIA herd statistics for 1965-66 are shown in tables 3 through 8. Cow-year averages for each State reporting production data are shown in table 3 and for each State having complete reports, in table 4.

Stratifications of herd averages by level of butterfat production, concentrates fed, and feed cost per hundredweight of milk are given in tables 5, 6, and 7, respectively. The trends apparent in these tabulations should be interpreted with caution because of the possible confounding effects resulting from disproportionate representation of breeds, milk prices, and feeding systems and costs.

Within-breed stratifications of Standard DHIA herd averages by milk yield are shown in table 8. Breeds are tabulated separately to reduce the complicating effect of breed-to-breed differences in production and in feed and milk prices. Such tabulations are useful in establishing guidelines for production efficiency, especially within breeds.

A rule of thumb in dairying is that profitable production is realized only if income is more than double the cost of feed. For average United States conditions, the levels of milk production at or below which profits are not expected are shown in table 9.

Only 4.9 percent of the Standard DHIA herds produced less than the milk levels indicated in Table 9. Approximately

1,795 herd owners (6.4 percent) reported income over feed cost of less than $200 per cow, and approximately 13,820 owners (49.3 percent) reported income over feed cost of $300 or more. However, if it is assumed that milk production levels of 7,000 pounds per cow are minimal for profit among herds at large, approximately half the cows other than those on Standard DHIA are marginal or submarginal producers.

In the Holstein herds summarized in table 8, estimated income over feed cost increased approximately $31 per cow for each 1,000-pound increase in milk production. As herd yields increased from 8,000 to 17,000 pounds of milk, feed costs increased 67 percent, feed cost per hundredweight of milk decreased 20 percent, and income over feed cost increased 168 percent. Assuming "net profit" equals value of product minus twice feed cost, income increased sharply as production level increased. At milk production intervals of 1,000 pounds for herds averaging 10,000 to 19,000 pounds, the estimated net profit per cow was 5, 19, 36, 54, 70, 86, 108, 122, 135, and 181 dollars, respectively. Changes and general trends were similar for each of the other breeds as well.

Although 12 less Ayrshire herds were tabulated this year than last, 103 herds produced 11,500 pounds of milk or more compared with 92 herds a year ago; 9 herds produced 13,500 pounds or more, whereas only 8 herds did so a year ago. Guernsey herds at or above the 11,500-pound level of production numbered 93 compared with 85 a year ago. Holstein herds at the 15,500-pound level or above increased 180 over last year. A total of 90 Holstein herds exceeded 17,499 pounds of milk. Jersey herds producing 9,500 pounds and above numbered 268 in 1965-66; in 1964-65, 231 such herds were reported. A total of 585 Brown Swiss herds were reported this year compared with 617 a year ago, and only 101 herds produced at or above the 12,500-pound level of production compared with 104 last year. Two less Milking Shorthorn herds were reported this year than last, and only 9 herds produced at or above the 10,500-pound level this year compared to 14 herds last year. All of these production averages reflect the actual yield of DHIA cows during a 12-month period.

It must be realized that the applicability of these DHIA herd statistics to individual herds will have the greatest meaning where local feeding systems and costs and milk markets are reasonably consistent with U.S. averages. Herds of the same breed having similar levels of milk yield may differ considerably in production efficiency if a wide range exists in milk prices, feeding systems and costs, and labor and other costs.

OWNER-SAMPLER HERD SUMMARIES 1965-66

Summaries of Owner-Sampler herd statistics are shown in tables 10 through 15. A total of 598,133 cows in 19,172 herds averaged 11,472 pounds of milk and 425 pounds of butterfat in 1965-66. This is an increase of 70 pounds of milk and 2 pounds of butterfat over 1964-65. The increase in reporting Owner-Sampler records was encouraging this year. The herds reported numbered 763 more than a year ago, and complete herd reports totaled 741 more than a year ago.

Cow-year averages by States for all data reported are given in table 10. Similar averages based on complete reports are shown in table 11. Stratifications of Owner-Sampler herds by butterfat production, level of concentrates fed, and feed cost per hundredweight of milk are shown in tables 12, 13, and 14, respectively. Summaries by breed with stratifications by level of milk yield are shown in table 15.

Year2/	Standard DHIA cows							All other cows 1/			Superiority of Std. DHIA cows	
	Herds	Cows	Cows per herd	Percent of all cows 3/	Milk	Fat	Fat	Milk	Fat	Fat	Milk	Fat
	Number	Number	Number	Percent	Pounds	Percent	Pounds	Pounds	Percent	Pounds	Pounds	Pounds
1930	27,888	507,549	18.2	2.3	7,642	3.96	303	4,435	3.92	174	3,207	129
1940	27,948	676,141	24.2	2.9	8,133	4.07	331	4,519	3.96	179	3,614	152
1950	40,100	1,088,872	27.2	4.9	9,172	4.03	370	5,113	3.95	202	4,059	168
1960	41,293	1,746,752	42.3	9.8	4/10,561	4/3.87	4/409	6,606	3.74	247	3,955	162
1961	42,558	1,867,469	43.9	10.6	10,796	3.87	418	5/6,550	5/3.74	5/245	4,246	173
1962	42,034	1,958,355	46.6	11.3	11,032	3.86	426	6,739	3.72	251	4,293	175
1963	41,937	2,006,534	47.8	11.8	11,286	3.85	434	6,872	3.71	255	4,414	179
1964	40,670	2,010,144	49.4	12.2	11,685	3.83	447	6,990	3.69	258	4,695	189
1965	40,075	2,087,581	52.1	13.0	11,976	3.82	457	7,268	3.67	267	4,708	190
1966	38,879	2,058,592	52.9	13.3	12,127	3.81	462	7,459	3.67	274	4,668	188

1/ Derived using U.S. cow population and production figures, excluding heifers not fresh as estimated by the Statistical Reporting Service. Also includes cows on the Owner-Sampler and Weigh-a-Day-a-Month recordkeeping plans.
2/ The year for which the Standard January 1 enrollment is given.
3/ Calculated using U.S. calendar year cow numbers for year previous to stated year; for example: January 1, 1966 DHIA enrollment of 2,058,592 cows is 13.3 percent of the 1965 U.S. total of 15,477,000 cows.
4/ Average of 1958-59 and 1960-61 because testing year changed in 1961.
5/ Comparison began to be made between DHIA production for the testing year ending May 14 of the stated year and U.S. production for the previous calendar year.

TABLE 2.--A 10-year summary of DHIA cow-year averages for herds reporting complete information

Year	Herds	Cows	Cows per herd	Milk	Fat	Fat	Conc. fed	Succ. forage fed	Dry forage fed	Value of product	Cost of conc.	Feed cost	Income over feed cost
	Number	Number	Number	Lb.	Pct.	Lb.	Cwt.	Cwt.	Cwt.	$	$	$	$
1956-57	27,133	863,275	31.8	9,621	3.92	377	30	66	39	448	88	183	265
1957-58	27,525	900,269	32.7	9,787	3.91	383	31	69	40	462	92	190	272
1958-59	27,796	902,074	32.5	10,042	3.89	391	33	75	40	475	93	195	280
1959-60 1/	23,220	795,892	34.3	10,045	3.89	391	33	76	40	479	93	196	283
1960-61	18,644	689,710	37.0	10,048	3.88	390	32	78	39	485	94	198	287
1961-62	22,853	882,827	38.6	10,676	3.87	413	36	82	40	502	103	207	295
1962-63	27,093	1,089,290	40.2	10,983	3.85	423	39	92	40	501	113	222	279
1963-64	27,893	1,173,099	42.1	11,428	3.84	439	42	98	38	521	120	237	284
1964-65	28,237	1,229,676	43.5	11,744	3.82	449	44	102	38	539	127	244	295
1965-66	28,013	1,260,621	45.0	11,885	3.81	453	45	108	36	559	133	256	303
10-year change: 2/ gross -------------			+13.2	+2,264	-0.11	+76	+15	+42	-3	+111	+45	+73	+38
percentage -------			+41.5	+23.5	-2.8	+20.2	+50.0	+63.6	-7.7	+24.8	+51.1	+39.9	+14.3

1/ Average of 1958-59 and 1960-61 because of change in testing year.
2/ During this period, the hundredweight price of milk changed +4 cents gross and +0.9 percent.

TABLE 3.--Summary of 1965-66 Standard DHIA cow-year production, by States [1]

State	Herd records	Cow-years [2]	Cows per herd	Cow-year average production		
				Milk	Fat	Fat
	Number	Number	Number	Pounds	Percent	Pounds
Alabama	260	22,867	88.0	9,366	3.9	367
Alaska	5	195	39.0	11,332	3.7	423
Arizona	112	18,881	168.6	12,725	3.6	459
Arkansas	59	2,663	45.1	11,137	3.6	403
California	1,826	336,345	184.2	13,060	3.8	495
Colorado	191	12,867	67.4	12,218	3.7	453
Connecticut	400	21,181	53.0	12,878	3.9	502
Delaware	91	4,391	48.3	11,865	3.8	455
Florida	105	16,803	160.0	9,400	4.0	378
Georgia	342	25,183	73.6	10,805	3.8	413
Hawaii	2	280	140.0	11,736	3.2	380
Idaho	451	19,292	42.8	11,621	3.9	448
Illinois	1,343	53,115	39.5	11,960	3.8	456
Indiana	1,043	39,629	38.0	12,063	3.9	466
Iowa	1,580	54,279	34.4	11,451	3.7	429
Kansas	722	31,630	43.8	11,858	3.7	442
Kentucky	377	15,578	41.3	10,640	3.8	406
Louisiana	44	3,834	87.1	8,598	3.9	334
Maine	393	17,243	43.9	12,111	4.0	479
Maryland	635	35,696	56.2	11,570	3.9	455
Massachusetts	438	19,832	45.3	12,334	4.0	489
Michigan	1,808	75,855	42.0	12,529	3.7	469
Minnesota	2,884	95,046	33.0	11,960	3.7	448
Mississippi	178	13,168	74.0	8,779	4.0	352
Missouri	366	16,998	46.4	11,533	3.8	440
Montana	48	2,468	51.4	12,161	3.6	434
Nebraska	334	14,239	42.6	11,337	3.7	422
Nevada	29	3,094	106.7	11,999	3.7	446
New Hampshire	256	11,724	45.8	12,061	4.0	480
New Jersey	419	23,567	56.2	12,701	3.8	485
New Mexico	24	3,655	152.3	12,266	3.6	443
New York	3,582	172,816	48.2	13,029	3.7	481
North Carolina	708	40,989	57.9	11,502	3.8	437
North Dakota	137	4,717	34.4	10,940	3.7	405
Ohio	2,094	83,308	39.8	12,189	3.8	465
Oklahoma	177	10,248	57.9	11,160	3.6	405
Oregon	356	22,596	63.5	11,168	4.1	457
Pennsylvania	4,329	164,242	37.9	12,223	3.9	477
Rhode Island	41	2,138	52.1	11,624	4.0	463
South Carolina	233	20,050	86.1	10,089	4.0	406
South Dakota	146	5,620	38.5	11,399	3.6	414
Tennessee	419	23,053	55.0	10,240	4.0	414
Texas	272	23,588	86.7	10,758	3.7	402
Utah	355	17,322	48.8	12,376	3.7	459
Vermont	823	40,370	49.1	11,689	3.9	458
Virginia	920	55,085	59.9	11,836	3.8	449
Washington	451	26,612	59.0	12,638	3.9	490
West Virginia	182	8,207	45.1	10,838	3.8	414
Wisconsin	2,875	119,049	41.4	12,092	3.8	458
Wyoming	21	932	44.4	11,699	3.6	420
Total or average	34,886	1,852,533	53.1	12,127	3.8	462

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[1] Includes all production data reported.

[2] Rounded to the nearest cow-year.

State	Herds	Body weight	Cow-years 2/	Milk	Fat	Fat	Days in milk	Concen-trates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concen-trates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	$	$	$	$	$
Alabama---------	257	11	22,608	9,332	3.9	366	83	49	54	16	530	158	247	283	2.65
Arkansas--------	59	11	2,663	11,137	3.6	403	84	44	33	38	514	133	226	288	2.03
Connecticut-----	393	12	20,926	12,900	3.9	503	85	53	148	29	721	185	334	387	2.59
Delaware--------	91	11	4,391	11,865	3.8	455	85	41	140	20	632	133	302	330	2.55
Florida---------	102	10	16,491	9,336	4.0	377	83	48	59	27	582	154	263	319	2.81
Georgia---------	341	11	25,135	10,808	3.8	414	84	46	93	17	639	153	271	368	2.51
Hawaii----------	2	13	280	11,736	3.2	380	78	51	20	88	905	238	498	407	4.24
Idaho-----------	82	11	2,968	10,930	4.0	435	86	32	61	73	418	84	200	218	1.83
Illinois--------	1,316	12	51,975	11,951	3.8	456	84	42	83	38	484	103	201	283	1.68
Indiana---------	1,043	12	39,629	12,063	3.9	466	85	43	108	35	520	110	224	296	1.85
Iowa------------	1,579	12	54,242	11,449	3.7	429	84	47	112	37	432	112	205	227	1.79
Kansas----------	721	12	31,628	11,858	3.7	442	85	49	94	45	503	134	225	278	1.89
Kentucky--------	376	11	15,511	10,611	3.8	405	83	39	71	26	476	118	227	249	2.14
Louisiana-------	44	10	3,834	8,598	3.9	334	81	39	63	12	497	130	229	268	2.66
Maine-----------	388	12	16,995	12,120	4.0	479	85	49	74	48	635	168	289	346	2.38
Maryland--------	564	12	31,143	11,626	3.9	459	84	46	113	25	579	141	295	302	2.53
Massachusetts---	437	11	19,798	12,338	4.0	489	85	49	124	38	723	174	340	383	2.76
Michigan--------	1,796	12	74,065	12,534	3.7	469	86	44	102	47	518	100	206	312	1.65
Minnesota-------	2,855	12	94,040	11,966	3.7	448	85	44	109	45	432	94	191	241	1.59
Mississippi-----	178	10	13,168	8,779	4.0	352	83	37	89	11	452	117	194	258	2.21
Missouri--------	363	12	16,820	11,513	3.8	440	85	44	72	36	505	122	222	283	1.93
Montana---------	4	14	219	12,342	3.2	393	86	35	---	86	462	83	197	265	1.60
Nebraska--------	327	12	14,112	11,340	3.7	422	84	43	105	46	466	117	208	258	1.83
New Hampshire---	256	11	11,724	12,061	4.0	480	85	46	113	42	654	156	320	334	2.66
New Jersey------	419	13	23,567	12,701	3.8	485	85	45	168	32	669	152	351	318	2.76
New York--------	3,582	12	172,816	13,029	3.7	481	84	43	123	41	605	144	283	322	2.17
North Carolina--	706	12	40,901	11,501	3.8	436	85	48	168	12	674	164	298	376	2.59
North Dakota----	136	13	4,699	10,941	3.7	405	83	42	93	46	406	87	161	245	1.47
Ohio------------	2,093	12	83,284	12,191	3.8	465	86	44	118	38	540	114	239	301	1.96
Oklahoma--------	177	11	10,248	11,160	3.6	405	82	46	45	55	511	129	224	287	2.01
Oregon----------	6	11	325	9,621	4.5	430	82	27	52	53	502	100	222	280	2.31
Pennsylvania----	4,304	12	163,431	12,227	3.9	477	85	47	103	41	596	147	285	311	2.33
Rhode Island----	41	12	2,138	11,624	4.0	463	85	48	131	34	744	173	364	380	3.13
South Carolina--	231	11	20,006	10,084	4.0	406	84	42	111	18	587	137	262	325	2.60
South Dakota----	146	12	5,620	11,399	3.6	414	84	42	104	53	459	98	190	269	1.67
Tennessee-------	417	11	22,972	10,240	4.0	414	84	40	102	22	532	128	251	281	2.45
Texas-----------	270	11	23,347	10,739	3.7	401	83	48	60	39	541	140	252	289	2.34
Vermont---------	815	11	39,985	11,690	3.9	458	84	41	76	43	580	146	276	304	2.36
Virginia--------	914	12	54,714	11,855	3.8	450	85	46	148	19	642	158	296	346	2.49
West Virginia---	182	12	8,207	10,838	3.8	414	85	39	97	29	529	124	250	279	2.30
Total or average	28,013	12	1,260,621	11,885	3.8	453	85	45	108	36	559	133	256	303	2.15
Total or average 3/-----	34,886		1,852,533	12,127	3.8	462									

1/ Cow-year basis, based on complete individual herd reports.
2/ Rounded to the nearest cow-year.
3/ Based on all data reported in Table 3.

TABLE 5.--Summary of 1965-66 Standard DHIA yearly herd averages, stratified by butterfat pounds [1]

Grouping	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk	Concen-trates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concen-trates	Feed cost	Income over feed cost	Feed cost per cwt. milk
Lb.	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	$	$	$	$	$
Under 175	6	11	37.5	5,383	2.9	154	69	27	76	24	227	70	151	76	2.77
175-224	57	11	59.5	5,417	3.8	208	71	26	42	26	261	79	153	108	2.84
225-274	226	11	51.3	6,612	3.9	255	76	31	56	30	309	87	175	134	2.67
275-324	859	11	51.7	7,845	3.9	304	80	34	72	32	362	96	191	171	2.46
325-374	2,484	11	47.8	9,162	3.9	353	82	37	80	35	420	106	208	212	2.30
375-424	5,304	12	46.3	10,508	3.8	402	84	41	89	38	475	116	226	249	2.16
425-474	7,490	12	44.8	11,794	3.8	450	85	45	99	39	532	127	244	288	2.08
475-524	6,774	12	43.4	13,099	3.8	498	86	48	105	41	596	139	265	331	2.03
525-574	3,506	12	43.5	14,339	3.8	545	86	52	112	42	663	154	289	374	2.03
575-624	1,058	13	42.0	15,487	3.8	594	87	55	110	43	731	168	309	422	2.00
625-674	203	13	42.5	16,607	3.9	642	88	58	119	47	804	182	335	469	2.03
675-724	42	12	36.0	17,579	3.9	692	88	64	121	49	875	206	369	506	2.11
725-774	4	14	42.5	20,057	3.8	757	88	66	149	52	1,070	232	402	668	2.01
Total or average	28,013	12	45.0	11,956	3.8	456	85	45	98	39	545	130	249	296	2.11

[1] All groupings and the total or average line are on a herd basis.

TABLE 6.--Summary of 1965-66 Standard DHIA yearly herd averages, stratified by hundredweight concentrates fed [1]

Grouping	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk	Concen-trates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concen-trates	Feed cost	Income over feed cost	Feed cost per cwt. milk
Cwt.	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	$	$	$	$	$
No Rept.	5	12	54.0	10,895	3.5	386	83	--	150	47	509	---	154	355	1.45
Under 5	2	11	144.7	10,681	4.5	478	87	2	95	36	553	212	300	253	2.92
05-14	32	11	49.1	8,045	4.0	321	82	12	85	41	348	53	158	190	1.94
15-24	503	11	43.4	8,593	4.1	353	82	21	70	39	390	63	165	225	2.00
25-34	4,139	11	45.7	9,941	4.0	400	84	31	89	37	460	88	200	260	2.07
35-44	9,282	12	45.6	11,482	3.9	443	85	40	99	39	524	114	233	291	2.07
45-54	8,713	12	44.7	12,650	3.8	475	85	49	103	40	574	141	265	309	2.12
55-64	3,957	12	43.6	13,405	3.7	498	86	59	98	40	610	169	291	319	2.19
65-74	1,127	12	44.3	13,962	3.7	515	86	68	93	41	639	197	316	323	2.28
75-84	211	12	46.5	14,266	3.7	524	86	78	91	38	660	225	337	323	2.40
85-UP	42	12	59.0	14,358	3.6	524	86	88	86	31	723	265	374	349	2.62
Total or average	28,013	12	45.0	11,956	3.8	456	85	45	98	39	545	130	249	296	2.11

[1] All groupings and the total or average line are on a herd basis.

TABLE 7.--Summary of 1965-66 Standard DHIA yearly herd averages, stratified by feed cost per hundredweight milk [1]

Grouping	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk	Concen-trates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concen-trates	Feed cost	Income over feed cost	Feed cos per cwt. milk
Cents	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	$	$	$	$	$
Under 175	7,083	12	36.9	12,690	3.7	471	86	43	86	43	500	99	193	307	1.52
175-224	10,589	12	43.5	12,163	3.8	461	85	45	98	40	542	127	243	299	2.00
225-274	7,340	12	50.2	11,684	3.9	453	85	47	104	36	588	152	288	300	2.46
275-324	2,410	11	56.0	10,497	4.1	427	84	47	110	34	573	158	308	265	2.94
325-374	494	11	60.7	9,075	4.3	390	83	45	108	33	524	156	310	214	3.42
375-424	79	11	59.8	7,906	4.3	342	80	43	99	36	469	152	313	156	3.96
425-474	16	11	40.3	7,953	4.4	349	80	48	68	43	486	182	341	145	4.29
475-UP	1	11	90.1	5,301	4.9	260	72	32	158	4	342	112	256	86	4.83
Total or average	28,013	12	45.0	11,956	3.8	456	85	45	98	39	545	130	249	296	2.11

[1] All groupings and the total or average line are on a herd basis.

TABLE 8.--Summary of 1965-66 Standard DHIA yearly herd averages by breed, stratified by milk pounds 1/

Grouping	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
Lb.	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	$	$	$	$	$
AYRSHIRE															
Under 7,500	11	10	46.3	6,725	3.9	264	76	26	62	28	329	80	164	165	2.42
7,500- 8,499	34	11	41.8	8,105	4.0	327	81	34	65	37	389	97	196	193	2.42
8,500- 9,499	109	11	39.0	9,031	4.0	364	82	35	70	37	425	105	208	217	2.31
9,500-10,499	122	11	37.9	9,966	4.1	404	83	39	78	39	486	118	227	259	2.28
10,500-11,499	119	11	43.6	10,993	4.0	443	84	42	77	41	541	131	250	291	2.28
11,500-12,499	67	11	46.5	11,968	4.0	479	84	46	95	39	587	144	266	321	2.23
12,500-13,499	27	11	43.2	12,855	4.0	510	85	45	77	42	618	154	277	341	2.15
13,500-Up	9	12	30.4	14,254	3.9	559	87	53	100	42	726	180	321	405	2.26
Total or average	498	11	41.2	10,312	4.0	415	83	40	78	39	501	122	235	266	2.28
GUERNSEY															
Under 5,500	13	10	57.5	4,898	4.7	231	73	23	71	23	284	71	163	121	3.33
5,500- 6,499	49	10	66.2	6,126	4.8	291	80	30	65	28	341	87	178	163	2.91
6,500- 7,499	176	10	46.0	7,054	4.7	335	83	32	71	31	370	91	183	187	2.60
7,500- 8,499	381	10	44.9	8,041	4.8	386	84	34	71	33	433	99	196	237	2.44
8,500- 9,499	592	10	44.5	9,021	4.8	433	85	38	73	36	484	108	213	271	2.37
9,500-10,499	467	10	42.9	9,953	4.8	475	86	40	77	36	540	118	228	312	2.29
10,500-11,499	255	11	41.1	10,899	4.7	514	87	43	76	37	581	128	239	342	2.19
11,500-12,499	58	11	37.9	11,909	4.6	551	87	47	65	40	655	153	270	385	2.26
12,500-13,499	21	11	46.8	12,815	4.4	559	87	48	67	42	652	148	264	388	2.06
13,500-14,499	10	12	28.9	13,907	3.9	546	86	47	134	42	691	145	305	386	2.19
14,500-Up	4	13	18.8	15,120	3.8	575	88	59	134	48	741	182	336	405	2.23
Total or average	2,026	10	44.2	9,179	4.7	436	85	38	74	35	493	111	216	277	2.37
HOLSTEIN															
Under 6,500	41	11	48.1	5,878	3.7	215	73	25	53	32	269	75	163	106	2.77
6,500- 7,499	92	11	46.6	7,116	3.7	266	77	32	69	31	325	92	185	140	2.60
7,500- 8,499	259	11	50.1	8,073	3.7	299	79	34	79	32	364	95	196	168	2.43
8,500- 9,499	663	12	48.5	9,071	3.7	333	81	36	89	34	405	104	209	196	2.31
9,500-10,499	1,457	12	47.7	10,072	3.7	370	83	39	94	37	441	109	218	223	2.16
10,500-11,499	2,776	12	45.7	11,049	3.7	406	84	42	100	38	485	118	233	252	2.11
11,500-12,499	4,195	12	45.5	12,018	3.7	441	85	45	105	40	528	126	246	282	2.05
12,500-13,499	4,722	12	44.7	12,996	3.7	478	85	48	110	41	574	136	260	314	2.00
13,500-14,499	3,854	12	43.9	13,974	3.7	514	86	50	110	42	622	145	276	346	1.97
14,500-15,499	2,139	13	43.7	14,934	3.7	547	86	53	114	43	668	157	291	377	1.95
15,500-16,499	831	13	43.0	15,907	3.7	581	87	56	109	43	724	169	308	416	1.94
16,500-17,499	257	13	42.1	16,914	3.6	616	87	59	110	49	778	179	328	450	1.94
17,500-18,499	67	13	43.9	17,876	3.6	647	88	61	110	48	827	189	346	481	1.93
18,500-Up	23	13	41.8	19,071	3.5	674	89	63	110	50	851	194	335	516	1.75
Total or average	21,376	12	45.1	12,684	3.7	466	85	47	106	40	562	134	257	305	2.04

See footnote at end of table.

TABLE 8.--Summary of 1965-66 Standard DHIA yearly herd averages by breed, stratified by milk pounds 1/--Continued

Grouping	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
Lb.	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	$	$	$	$	$
JERSEY															
Under 5,500	30	9	49.4	4,982	5.0	250	75	25	34	24	256	69	135	121	2.70
5,500- 6,499	108	9	50.1	6,108	5.1	309	81	30	44	26	334	90	167	167	2.74
6,500- 7,499	263	9	53.8	7,039	5.1	361	83	33	50	27	384	96	179	205	2.54
7,500- 8,499	475	9	47.3	8,028	5.1	411	85	36	55	29	441	106	192	249	2.40
8,500- 9,499	403	9	47.1	8,973	5.1	461	86	39	60	32	502	118	213	289	2.37
9,500-10,499	181	9	43.7	9,927	5.1	502	86	41	63	33	555	130	230	325	2.32
10,500-11,499	57	9	45.8	10,863	4.9	536	87	45	65	33	628	152	261	367	2.40
11,500-Up	30	10	47.4	12,130	4.5	537	87	46	89	41	635	148	273	362	2.25
Total or average	1,547	9	48.1	8,319	5.1	423	84	37	56	30	460	111	201	259	2.43
BROWN SWISS															
Under 7,500	17	13	22.6	6,470	4.1	266	74	31	49	43	267	76	165	102	2.55
7,500- 8,499	34	12	32.2	8,027	4.0	322	81	35	90	42	326	90	198	128	2.46
8,500- 9,499	67	12	31.2	9,086	4.1	373	83	38	71	45	391	98	202	189	2.23
9,500-10,499	129	12	32.1	10,038	4.1	412	85	42	84	40	442	111	215	227	2.15
10,500-11,499	122	13	34.5	11,006	4.1	453	85	43	91	43	489	116	227	262	2.06
11,500-12,499	115	13	32.9	12,011	4.2	499	86	48	89	46	531	127	240	291	1.99
12,500-13,499	68	13	32.6	12,893	4.1	527	86	47	102	43	605	133	257	348	1.99
13,500-14,499	26	13	31.3	13,905	4.1	566	86	53	94	48	631	150	273	358	1.97
14,500-Up	7	13	29.6	14,919	4.1	612	89	55	93	45	670	150	285	385	1.91
Total or average	585	13	32.4	10,860	4.1	446	85	44	87	43	482	116	227	255	2.11
MILKING SHORTHORN															
Under 6,500	6	12	44.6	5,988	3.7	221	72	31	18	34	241	82	156	85	2.61
6,500- 7,499	18	12	22.5	7,024	3.7	262	78	32	50	40	250	71	149	101	2.12
7,500- 8,499	23	12	23.1	7,934	3.8	301	79	33	41	36	291	79	155	136	1.95
8,500- 9,499	31	12	26.1	9,010	3.7	334	82	35	46	37	350	87	170	180	1.88
9,500-10,499	16	13	29.5	9,922	3.7	369	82	37	59	39	415	99	203	212	2.06
10,500-11,499	6	12	30.0	10,871	3.7	398	84	36	80	36	421	81	168	253	1.54
11,500-Up	3	12	24.3	12,048	3.6	431	88	40	112	46	524	133	240	284	2.02
Total or average	103	12	26.6	8,585	3.7	319	80	34	50	38	332	85	169	163	1.99
MIXED BREEDS															
Under 5,500	16	10	69.3	5,062	4.2	213	73	26	30	20	274	80	150	124	2.96
5,500- 6,499	28	10	62.1	6,024	4.2	253	79	31	67	21	322	91	174	148	2.90
6,500- 7,499	79	10	51.4	7,060	4.2	295	80	33	52	29	371	103	196	175	2.78
7,500- 8,499	142	10	59.9	8,060	4.2	340	82	37	66	28	429	114	217	212	2.69
8,500- 9,499	256	11	54.6	9,034	4.2	376	84	39	74	30	462	118	224	238	2.48
9,500-10,499	374	11	48.7	10,017	4.1	406	85	42	76	36	501	126	239	262	2.39
10,500-11,499	332	11	51.3	10,996	3.9	434	85	44	84	37	537	134	253	284	2.30
11,500-12,499	276	11	43.1	11,959	3.9	465	86	47	88	39	573	143	266	307	2.22
12,500-13,499	204	11	41.2	12,995	3.8	498	86	49	96	40	626	147	280	346	2.15
13,500-14,499	105	11	38.5	13,949	3.8	531	87	52	92	41	654	159	289	365	2.07
14,500-15,499	39	11	36.1	14,844	3.8	564	87	57	111	41	692	171	306	386	2.06
15,500-Up	16	12	28.0	16,327	3.7	606	88	56	63	52	753	170	304	449	1.85
Total or average	1,867	11	48.7	10,668	4.0	424	85	43	80	35	526	132	247	279	2.36

1/ All groupings and the total or average line are on a herd basis.

TABLE 9.--Levels of milk production at or below which dairy profits are not expected in the United States

Breed	Milk level	Herds that do not exceed milk level	
	Pounds	Number	Percent
Ayrshire	8,105	45	9.0
Guernsey	6,126	62	3.1
Holstein	9,071	1,055	4.9
Jersey	4,982	30	1.9
Brown Swiss	9,086	118	20.2
Milking Shorthorn 1/	7,934	47	1/45.6

1/ Only 103 Milking Shorthorn herds represented.

TABLE 10.--Summary of 1965-66 Owner-Sampler cow-year production, by States [1]

State	Herd records	Cow-year [2]	Cows per herd	Cow-year average production		
				Milk	Fat	Fat
	Number	Number	Number	Pounds	Percent	Pounds
Alabama----------------	6	371	61.8	11,003	3.5	387
Alaska-----------------	3	36	12.0	9,735	3.6	352
Arizona----------------	2	130	65.0	12,343	3.7	452
Arkansas---------------	27	1,110	41.1	10,043	3.7	370
California-------------	2	336	168.0	11,168	4.3	475
Colorado---------------	14	665	47.5	10,793	3.7	399
Connecticut------------	70	2,805	40.1	12,131	3.8	467
Delaware---------------	13	403	31.0	10,183	4.1	417
Georgia----------------	3	227	75.7	12,704	3.5	445
Idaho------------------	14	273	19.5	11,110	3.9	435
Illinois---------------	312	9,956	31.9	11,559	3.7	427
Indiana----------------	86	2,571	29.9	12,067	3.8	453
Iowa-------------------	837	20,782	24.8	10,851	3.7	399
Kansas-----------------	89	2,743	30.8	11,306	3.7	417
Kentucky---------------	30	1,001	33.4	10,555	3.8	397
Louisiana--------------	4	232	58.0	9,664	3.5	342
Maine------------------	88	3,243	36.9	11,693	3.9	452
Maryland---------------	59	2,461	41.7	11,201	3.9	434
Massachusetts----------	69	2,316	33.6	11,572	3.9	449
Michigan---------------	1,400	43,918	31.4	12,147	3.7	450
Minnesota--------------	1,466	39,139	26.7	11,185	3.7	411
Mississippi------------	1	73	73.0	5,192	4.8	247
Missouri---------------	25	808	32.3	11,420	3.8	431
Montana----------------	36	2,121	58.9	11,337	3.7	416
Nebraska---------------	57	1,792	31.4	10,703	3.5	378
Nevada-----------------	1	1,149	1149.0	16,602	3.3	543
New Hampshire----------	44	1,629	37.0	10,659	3.9	420
New Jersey-------------	37	1,786	48.3	11,962	3.8	451
New Mexico-------------	3	1,384	461.3	12,309	3.5	428
New York---------------	2,100	77,618	37.0	12,183	3.7	445
North Carolina---------	36	1,387	38.5	10,727	3.8	407
North Dakota-----------	21	536	25.5	9,185	3.7	344
Ohio-------------------	523	14,704	28.1	11,570	3.7	432
Oklahoma---------------	25	1,044	41.8	11,499	3.6	410
Oregon-----------------	28	914	32.6	9,552	4.6	436
Pennsylvania-----------	1,160	33,920	29.2	11,410	3.8	438
Rhode Island-----------	2	22	11.0	10,145	3.7	375
South Carolina---------	1	46	46.0	8,450	4.2	356
South Dakota-----------	54	1,894	35.1	10,723	3.5	379
Tennessee--------------	3	131	43.7	9,279	3.9	365
Texas------------------	12	683	56.9	10,320	3.8	394
Utah-------------------	24	697	29.0	12,323	3.7	456
Vermont----------------	249	9,179	36.9	10,541	4.0	422
Virginia---------------	56	1,934	34.5	12,146	3.7	449
Washington-------------	27	774	28.7	11,537	3.9	450
West Virginia----------	20	666	33.3	10,147	4.0	409
Wisconsin--------------	10,024	306,175	30.5	11,308	3.7	419
Wyoming----------------	9	352	39.1	10,055	3.5	351
Total or average-------------	19,172	598,133	31.2	11,472	3.7	425

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[1] Includes all production data reported.

[2] Rounded to the nearest cow-year.

TABLE 11.--Summary of 1965-66 Owner-Sampler DHIA records, by States 1/

State	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk	Concen-trates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concen-trates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	$	$	$	$	$
Alabama---------	6	12	371	11,003	3.5	387	86	58	98	13	598	185	279	319	2.54
Arkansas--------	27	11	1,110	10,043	3.7	370	82	41	52	36	470	123	210	260	2.09
Connecticut-----	69	12	2,784	12,170	3.8	468	84	51	114	31	674	177	316	358	2.60
Delaware--------	13	11	403	10,183	4.1	417	83	36	130	11	536	111	280	256	2.75
Georgia---------	3	12	227	12,704	3.5	445	85	52	115	2	712	181	251	461	1.98
Illinois--------	177	12	5,451	11,654	3.7	430	83	41	70	42	442	95	188	254	1.61
Indiana---------	69	12	2,063	12,246	3.7	459	85	43	99	37	510	112	219	291	1.79
Iowa------------	836	12	20,748	10,846	3.7	398	82	43	81	41	380	100	186	194	1.71
Kansas----------	89	12	2,743	11,306	3.7	417	84	47	79	44	451	127	205	246	1.82
Kentucky--------	29	12	945	10,687	3.8	402	84	43	71	27	459	122	228	231	2.13
Louisiana-------	4	11	232	9,664	3.5	342	82	47	30	12	535	154	239	296	2.47
Maine-----------	88	12	3,243	11,693	3.9	452	84	42	72	41	589	146	262	327	2.24
Maryland--------	58	12	2,418	11,196	3.9	433	84	42	116	23	559	130	276	283	2.47
Massachusetts---	69	11	2,316	11,572	3.9	449	84	45	121	37	665	160	321	344	2.77
Minnesota-------	1,411	12	37,679	11,192	3.7	411	83	42	101	46	388	88	184	204	1.64
Mississippi-----	1	9	73	5,192	4.8	247	80	39	---	19	291	120	165	126	3.18
Missouri--------	23	12	758	11,384	3.8	431	85	47	42	43	479	131	223	256	1.96
Nebraska--------	56	12	1,784	10,721	3.5	379	82	39	65	48	379	98	176	203	1.64
New Hampshire---	44	11	1,629	10,659	3.9	420	84	41	78	47	561	140	285	276	2.68
New Jersey------	37	12	1,786	11,962	3.8	451	84	40	179	28	626	131	327	299	2.73
New York--------	2,100	12	77,618	12,183	3.7	445	84	39	104	43	550	131	257	293	2.11
North Carolina--	36	12	1,387	10,727	3.8	407	85	47	144	12	625	156	285	340	2.65
North Dakota----	18	12	468	9,174	3.7	343	79	35	52	44	307	65	118	189	1.29
Ohio------------	325	12	9,536	11,664	3.7	436	85	42	102	39	502	107	226	276	1.94
Oklahoma--------	25	11	1,044	11,499	3.6	410	84	48	36	52	514	136	223	291	1.94
Pennsylvania----	1,153	11	33,674	11,417	3.8	439	84	44	90	45	534	137	271	263	2.38
Rhode Island----	2	13	22	10,145	3.7	375	59	63	7	52	561	238	372	189	3.67
South Carolina--	1	10	46	8,450	4.2	356	84	36	67	20	467	115	195	272	2.31
South Dakota----	54	12	1,894	10,723	3.5	379	83	40	80	57	406	92	182	224	1.70
Tennessee-------	3	11	131	9,279	3.9	365	86	36	90	23	465	106	226	239	2.44
Texas-----------	12	11	683	10,320	3.8	394	82	49	11	31	529	152	238	291	2.30
Vermont---------	186	11	6,861	10,945	4.0	433	84	38	56	45	541	136	261	280	2.39
Virginia--------	56	12	1,934	12,146	3.7	449	85	49	113	21	591	168	295	296	2.43
West Virginia---	16	12	555	10,771	4.0	430	85	41	99	23	550	138	285	265	2.65
Total or average	7,096	12	224,616	11,574	3.7	430	84	42	95	42	499	121	237	262	2.05
Total cr average 2/-----	19,172		598,133	11,472	3.7	425									

1/ Cow-year basis, based on complete individual herd reports only.
2/ Based on all data reported in Table 9.

TABLE 12.--Summary of 1965-66 Owner-Sampler DHIA yearly herd averages, stratified by butterfat pounds 1/

Grouping	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
Lb.	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	$	$	$	$	$
Under 225	9	11	18.7	5,047	4.3	213	74	19	36	45	206	53	134	72	2.73
225-274	91	11	26.3	6,780	3.7	254	76	28	48	40	263	74	153	110	2.27
275-324	364	11	28.7	8,195	3,7	304	80	32	66	41	322	83	175	147	2.15
325-374	1,002	11	30.4	9,498	3.7	354	82	36	77	42	380	96	195	185	2.07
375-424	1,863	12	31.9	10,755	3.7	401	83	40	85	44	444	109	217	227	2.03
425-474	1,990	12	32.1	12,030	3.7	448	84	44	89	44	510	125	241	269	2.01
475-524	1,317	12	32.5	13,295	3.7	496	85	48	94	44	580	141	265	315	2.00
525-574	379	12	33.5	14,468	3.8	543	86	51	94	45	658	159	287	371	1.99
575-624	67	12	29.6	15,540	3.8	591	86	54	96	46	713	170	300	413	1.94
625-674	10	12	26.5	16,414	3.9	643	89	55	122	48	800	184	329	471	2.00
675-Up	5	12	22.1	16,738	4.5	741	89	59	76	46	742	172	280	462	1.68
Total or average	7,096	12	31.7	11,473	3.7	428	83	42	86	44	484	119	231	253	2.03

1/ All groupings and the total or average line are on a herd basis.

TABLE 13.--Summary of 1965-66 Owner-Sampler DHIA yearly herd averages, stratified by hundredweight concentrates fed 1/

Grouping	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk	Concentrated fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
Cwt.	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	$	$	$	$	$
No Rept.	4	12	20.5	9,017	3.7	333	84	--	83	69	419	---	171	248	1.88
Under 5	3	10	34.8	10,109	4.0	405	85	2	67	71	477	7	158	319	1.56
05-14	13	11	26.7	8,735	3.7	324	83	12	100	46	340	33	138	202	1.56
15-24	255	11	30.3	8,870	3.8	341	81	21	72	44	367	61	161	206	1.86
25-34	1,477	11	33.0	10,191	3.8	388	83	31	87	44	438	89	201	237	2.00
35-44	2,590	12	32.7	11,392	3.7	425	83	40	90	44	482	114	227	255	2.02
45-54	1,865	12	30.4	12,251	3.7	452	84	49	86	44	513	136	249	264	2.05
55-64	689	12	29.8	12,931	3.7	475	84	59	77	44	541	162	271	270	2.11
65-74	161	12	28.1	13,221	3.7	486	85	68	70	43	553	187	292	261	2.24
75-84	34	12	26.2	13,750	3.6	500	85	78	56	51	547	202	305	242	2.24
85-Up	5	12	35.3	12,845	3.7	472	86	90	63	36	618	269	361	257	2.82
Total or average	7,096	12	31.7	11,473	3.7	428	83	42	86	44	484	119	231	253	2.03

1/ All groupings and the total or average line are on a herd basis.

TABLE 14.--Summary of 1965-66 Owner-Sampler DHIA yearly herd averages, stratified by feed cost per hundredweight milk 1/

Grouping	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
Cents	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	$	$	$	$	$
Under 175	2,066	12	27.4	11,703	3.7	428	83	41	72	44	427	92	178	249	1.52
175-224	2,946	12	33.2	11,689	3.7	432	84	42	91	44	496	121	233	263	1.99
225-274	1,596	12	33.8	11,268	3.8	430	83	44	91	43	532	143	276	256	2.45
275-324	402	11	33.2	10,172	3.9	401	82	45	92	44	517	150	298	219	2.94
325-374	67	11	36.5	8,571	4.2	359	82	42	98	43	452	144	294	158	3.44
375-424	16	10	29.6	8,143	4.4	355	82	41	99	46	447	148	313	134	3.85
425-474	3	11	39.5	7,859	4.2	327	67	58	51	33	472	230	346	126	4.39
Total or average	7,096	12	31.7	11,473	3.7	428	83	42	86	44	484	119	231	253	2.03

1/ All groupings and the total or average line are on a herd basis.

TABLE 15.--Summary of 1965-66 Owner-Sampler DHIA yearly herd averages by breed, stratified by milk pounds [1]

Grouping Lb.	Herds Number	Body weight Cwt.	Cow-years Number	Milk Lb.	Fat Pct.	Fat Lb.	Days in milk Pct.	Concentrates fed Cwt.	Succ. forage fed Cwt.	Dry forage fed Cwt.	Value of product $	Cost of concentrates $	Feed cost $	Income over feed cost $	Feed cost per cwt. milk $
AYRSHIRE															
Under 7,500	5	10	28.3	6,377	4.2	263	75	31	78	25	301	90	178	123	2.79
7,500- 8,499	8	10	22.1	7,893	4.0	314	79	34	44	36	339	112	193	146	2.44
8,500- 9,499	14	11	26.7	9,026	4.0	361	81	36	39	45	385	110	194	191	2.15
9,500-10,499	26	11	28.8	9,961	4.0	400	83	36	57	47	467	119	224	243	2.25
10,500-11,499	11	11	37.0	11,111	3.9	435	83	39	110	30	528	133	250	278	2.25
11,500-Up	6	11	36.0	12,485	3.9	478	85	40	120	42	555	116	242	313	1.94
Total or average	70	11	29.5	9,679	4.0	385	82	36	67	41	441	116	217	224	2.26
GUERNSEY															
Under 6,500	11	10	20.3	5,830	4.6	272	77	28	52	41	259	65	145	113	2.48
6,500- 7,499	37	10	27.8	7,039	4.8	335	81	30	56	40	341	80	169	172	2.40
7,500- 8,499	94	10	26.6	8,043	4.7	378	83	34	60	39	369	87	176	193	2.19
8,500- 9,499	91	10	28.9	9,039	4.7	422	85	38	63	41	434	104	201	233	2.23
9,500-10,499	51	10	32.6	9,873	4.4	438	85	36	71	34	469	108	206	263	2.09
10,500-11,499	19	11	32.3	10,895	4.2	463	85	41	70	40	514	114	215	299	1.98
11,500-Up	19	11	30.7	12,620	4.0	506	85	50	81	42	610	160	280	331	2.23
Total or average	322	10	28.7	8,861	4.6	404	84	36	64	39	419	99	194	225	2.21
HOLSTEIN															
Under 6,500	15	11	19.9	5,990	3.7	224	75	25	45	46	221	67	157	64	2.66
6,500- 7,499	47	11	28.2	7,093	3.7	260	77	27	57	38	273	69	149	124	2.10
7,500- 8,499	133	11	29.5	8,080	3.7	295	79	31	68	43	312	81	170	142	2.10
8,500- 9,499	316	12	29.6	9,070	3.6	331	81	34	75	42	350	88	183	167	2.02
9,500-10,499	673	12	31.4	10,042	3.7	367	82	37	84	43	403	99	205	198	2.04
10,500-11,499	1,107	12	32.9	11,028	3.6	401	83	40	92	43	445	108	216	229	1.96
11,500-12,499	1,269	12	32.6	11,990	3.6	436	84	43	92	45	492	120	234	258	1.95
12,500-13,499	1,186	12	33.3	12,982	3.6	473	85	47	95	45	547	134	254	293	1.96
13,500-14,499	623	12	33.7	13,942	3.6	507	85	49	95	45	602	146	270	332	1.94
14,500-15,499	241	12	33.1	14,880	3.6	540	85	52	95	45	649	158	286	363	1.93
15,500-16,499	67	13	33.8	15,860	3.6	572	86	53	91	48	692	161	287	405	1.81
16,500-Up	21	12	28.1	17,218	3.7	632	88	59	90	51	771	194	328	443	1.90
Total or average	5,698	12	32.5	11,871	3.6	432	83	43	90	44	491	120	233	258	1.97
JERSEY															
Under 5,500	8	9	24.1	4,670	5.4	252	75	25	18	32	231	60	111	120	2.40
5,500- 6,499	15	9	28.7	6,027	5.2	313	80	29	62	31	307	81	162	145	2.69
6,500- 7,499	39	9	28.0	7,070	5.1	362	83	32	43	36	357	92	173	184	2.44
7,500- 8,499	52	9	30.4	7,998	5.0	401	84	34	42	36	428	107	193	235	2.41
8,500- 9,499	51	9	29.6	8,909	5.0	445	85	38	51	38	481	124	218	263	2.45
9,500-10,499	33	10	31.6	9,876	4.6	459	85	39	42	44	527	133	232	295	2.35
10,500-11,499	8	10	31.5	11,035	4.7	520	86	45	47	38	568	141	237	331	2.15
11,500-Up	9	11	26.4	12,495	4.2	520	86	50	65	41	627	172	294	333	2.36
Total or average	215	9	29.5	8,374	4.9	411	84	36	46	38	441	113	202	239	2.42
BROWN SWISS															
Under 7,500	7	11	21.0	6,960	4.0	277	79	30	51	52	273	70	163	111	2.32
7,500- 8,499	10	12	22.5	7,928	3.9	312	80	30	57	43	313	81	176	137	2.21
8,500- 9,499	14	12	27.4	8,908	4.0	360	83	37	76	46	351	86	186	165	2.10
9,500-10,499	16	12	24.0	10,045	4.1	409	84	41	62	50	394	101	190	204	1.90
10,500-11,499	16	12	17.6	10,924	4.0	438	84	41	56	53	439	114	210	229	1.92
11,500-12,499	14	12	27.6	11,920	3.9	464	85	42	65	45	505	117	220	285	1.85
12,500-Up	6	12	27.8	13,003	3.9	502	86	49	89	48	506	119	233	274	1.80
Total or average	83	12	23.8	10,038	4.0	400	83	39	64	48	402	100	198	204	1.99
MILKING SHORTHORN															
7,500- 8,499	4	12	7.0	8,202	3.8	313	80	43	49	42	330	108	191	139	2.33
8,500- 9,499	3	12	27.6	9,321	4.0	377	83	27	60	44	363	77	163	200	1.75
9,500-Up	3	12	26.6	10,838	3.6	389	84	38	117	36	360	93	176	184	1.61
Total or average	10	12	19.1	9,329	3.8	355	82	37	73	41	349	94	178	171	1.94
MIXED BREEDS															
Under 6,500	9	10	24.4	5,721	4.6	262	77	26	54	31	278	73	153	125	2.67
6,500- 7,499	26	11	27.8	7,130	4.2	300	80	31	58	37	327	88	185	142	2.59
7,500- 8,499	55	11	25.6	8,061	4.1	330	82	33	54	37	349	93	188	161	2.33
8,500- 9,499	90	11	28.1	9,043	4.0	365	82	38	63	44	412	112	222	190	2.46
9,500-10,499	126	11	26.0	10,018	3.9	392	84	40	75	45	459	117	234	225	2.33
10,500-11,499	137	11	29.6	11,040	3.9	427	84	44	77	44	501	131	251	250	2.27
11,500-12,499	106	11	29.8	11,966	3.9	461	84	46	88	46	551	139	271	280	2.27
12,500-13,499	90	11	29.6	12,919	3.8	485	85	50	90	43	582	149	280	302	2.17
13,500-14,499	52	11	29.5	13,935	3.8	524	85	55	83	47	627	165	298	329	2.14
14,500-15,499	6	11	22.9	14,941	3.8	561	85	58	92	38	672	184	318	354	2.13
Total or average	697	11	28.3	10,781	3.9	419	84	43	76	44	489	127	246	243	2.30

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[1] All groupings and the total or average line are on a herd basis.

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February 1967

DHIA AGE ADJUSTMENT FACTORS FOR STANDARDIZING LACTATIONS TO A MATURE BASIS

by B. T. McDaniel, R. H. Miller, E. L. Corley,
and R. D. Plowman

The new age adjustment factors shown on the following pages were derived by USDA to adjust DHIA lactation records to a mature equivalent basis. These new age adjustment factors are more accurate than those presently in use because they take account of the effects of region, season, milk, and fat as well as those due to breeds. Their use became effective February 1, 1967, to standardize records for age at calving in USDA sire and cow evaluations.

The purpose of these adjustment factors is to remove the variation arising from age differences among cows that calved in the same herds in the same year and season (herdmates).

These factors may not adequately adjust for age differences among records in progress, especially those for cows with less than 120 days in milk (9). 1/

These new age adjustment factors were based on a total of 1,795,895 DHIA lactations initiated between January 1, 1950 and May 1, 1964. Records were used only from cows sired by

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1/ Underlined numerals in parentheses refer to Literature Cited on pages 3 and 4.

Issued March 1967

registered bulls and out of dams with valid DHIA identification, and where both parents were of the same breed. Records of 90 days or more in length were extended to a 305-day basis by DHIA projection factors (5) and included in the development of the age factors.

To establish age at maturity and mature yield, all consecutive 2-year moving averages between 5 and 10 years of age were computed. The 2-year period with the highest average yield was chosen as the age of mature yield. Adjustment factors were computed by use of the gross comparison method (7) in which the ratio between mature yield and production of the other ages was determined. The new factors were developed from these ratios after smoothing by use of a 5-month moving average as described by Miller (7).

Research has shown that age adjustment factors vary substantially between breeds, between seasons of calving, between geographical areas of the United States, and between milk and fat yield (1-4, 6-8, 10, 11). These variations are large enough to justify independent sets of factors. Separate sets of factors were developed for Ayrshire, Guernsey, Jersey, Holstein, Brown Swiss, and Milking Shorthorn cows. Factors for Mixed Breeds were obtained by averaging factors for all the breeds.

Because of the small number of records available, the factors for Red Dane cows were erratic but resembled those for Brown Swiss. Red Poll factors were also erratic but resembled those for Milking Shorthorn. For this reason it was deemed advisable to use the Brown Swiss factors for Red Dane cows and the Milking Shorthorn factors for Red Poll.

Factors were derived independently for cows calving in the period from November 1 through June 30 (Season I) and from July through October 31 (Season II). Separate factors for milk and fat yields were also computed in each season.

Different sets of factors were also developed for the various geographical areas in the United States. Initially, approximate factors were computed for a large number of regions consisting of individual or a small group of States. Analyses were conducted (6) and regions were consolidated as much as possible, consistent with removing the majority of the regional variation. The final stratification of the new factors also considered the number of records that were available from a breed in an area. Efforts were made to reduce sets of factors in situations where a very small number of cows were available. The States used in the final regional stratification for each breed are shown in table 1.

Percentage distribution of cows by age group, breed, region, and season is shown in table 2. The numbers of DHIA lactations used in developing sets of factors for each breed, region, and season are shown in table 3. The age at which mature (maximum) production was reached and the average yields in the 2-year period of maturity are shown in table 4 for each breed, region, season, and for yields of milk and fat.

Trends in milk and fat production with increasing age for Ayrshire, Guernsey, Holstein, Jersey, and Brown Swiss cows are illustrated by season in figures 1 and 2. The averages presented include all data used for these breeds from all areas of the United States. Variation in age adjustment factors for the two seasons reflects the differences between winter and summer calvings in the slopes of the age-yield curves.

The variation that exists between age adjustment factors for regions, seasons, and yields of milk and fat is illustrated by the graphic presentation of sets of factors in figures 3, 4, and 5. An example of differences between adjustment factors for milk and fat production is shown in figure 3. Regional differences are illustrated in figure 5 and seasonal diversity in figure 4.

The age adjustment factors are presented in tables 5 through 26. Factors for the two seasons, and for milk and fat yields for a breed-region class are shown in the individual tables.

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TABLE 1.--Grouping of States used for regional age correction factors [1]

Region number	States
	GUERNSEY AND JERSEY
I	Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania
II	Indiana, Illinois, Ohio, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas
III	Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, and Texas
IV	Idaho, Wyoming, Montana, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, and Hawaii
	HOLSTEIN
I	Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, and New York
II	New Jersey and Pennsylvania
III	Indiana, Illinois, Ohio, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas
IV	Delaware, Maryland, Virginia, Kentucky, Tennessee, North Carolina, West Virginia, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Arkansas
V	Idaho, Wyoming, Montana, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, Alaska, and Hawaii
VI	California
	AYRSHIRE AND BROWN SWISS
I	Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Idaho, Wyoming, Montana, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, and Hawaii
II	Indiana, Illinois, Ohio, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas
III	Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, and Texas

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[1] Nationwide sets of age correction factors were used for the Milking Shorthorn, Red Dane, Red Poll, and Mixed breeds because of the limited number of observations available.

TABLE 2.--Percentage distribution of cows by age group, breed, region, and season

Region and season	Age group--months											
	< 24	24-29	30-35	36-41	42-47	48-59	60-71	72-83	84-95	96-107	108-119	> 119
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
AYRSHIRE												
Region 1:[1] (N.E.and West)												
November-June	.64	10.58	8.07	10.46	8.31	16.46	13.21	10.27	7.72	5.46	3.66	5.16
July-October	.78	10.61	17.12	11.23	12.58	16.31	10.86	7.17	4.84	3.30	2.10	3.12
Region 2: (Midwest)												
November-June	1.34	14.92	9.23	13.00	8.03	16.82	12.35	8.97	5.96	3.88	2.45	3.05
July-October	1.54	11.39	17.87	11.18	12.53	16.21	10.93	6.74	4.53	2.78	1.87	2.42
Region 3: (South)												
November-June	1.16	10.97	9.74	10.63	8.61	16.06	12.56	9.71	6.75	5.12	3.59	5.10
July-October	1.42	10.06	15.83	11.23	11.83	16.38	11.18	7.81	5.32	3.44	2.09	3.41
GUERNSEY												
Region 1:[1] (Northeast)												
November-June	.91	13.50	7.16	11.50	7.75	15.93	12.84	9.90	7.48	5.12	3.41	4.51
July-October	1.26	14.24	13.54	11.12	10.71	15.26	10.91	7.92	5.32	3.74	2.51	3.47
Region 2: (Midwest)												
November-June	1.42	16.69	7.21	13.23	7.44	16.22	12.30	9.04	6.35	4.19	2.61	3.30
July-October	2.18	16.58	13.27	11.98	10.30	15.54	10.20	7.17	5.06	3.13	1.96	2.63
Region 3: (South)												
November-June	.91	11.60	8.45	10.28	8.66	16.40	13.05	10.26	7.39	5.04	3.46	4.50
July-October	1.26	11.52	15.17	10.21	11.43	15.53	11.05	7.94	5.66	3.92	2.46	3.87
Region 4: (West)												
November-June	1.45	15.12	8.07	11.81	8.07	16.00	12.15	9.08	6.67	4.41	2.92	4.26
July-October	1.67	16.67	11.80	12.02	9.43	15.22	10.93	7.72	5.22	3.51	2.32	3.50
HOLSTEIN												
Region 1:[1] (Northeast)												
November-June	1.23	15.34	6.90	12.85	7.32	16.53	12.84	9.48	6.76	4.50	2.88	3.37
July-October	1.85	13.83	16.23	11.25	11.89	15.52	10.59	7.08	4.58	2.98	1.88	2.33
Region 2:(Middle Atlantic)												
November-June	1.88	15.43	6.21	13.21	6.61	16.36	12.65	9.59	6.93	4.67	2.91	3.55
July-October	2.81	15.68	13.18	11.75	10.01	15.08	10.53	7.51	5.10	3.63	2.23	2.49
Region 3: (Midwest)												
November-June	1.55	17.33	7.67	13.37	7.49	16.39	12.25	8.86	6.02	3.89	2.42	2.77
July-October	2.42	14.81	14.51	11.45	11.09	15.58	10.66	7.21	4.91	3.13	1.97	2.27
Region 4: (South)												
November-June	1.37	13.40	10.48	11.59	8.45	15.80	12.58	9.25	6.63	4.42	2.79	3.24
July-October	1.79	11.66	15.21	11.82	11.38	16.37	11.24	7.77	5.08	3.18	2.06	2.46
Region 5: (West)												
November-June	1.73	17.00	9.43	12.33	8.45	16.03	11.86	8.42	5.84	3.74	2.34	2.84
July-October	1.91	15.75	13.91	12.17	10.73	15.74	10.62	7.16	4.69	3.03	1.93	2.37
Region 6: (California)												
November-June	.72	12.13	13.96	10.85	10.69	16.22	11.68	8.46	6.09	3.98	2.45	2.76
July-October	.72	12.38	17.88	11.20	11.62	15.96	10.76	6.97	5.07	3.35	2.03	2.07
JERSEY												
Region 1:[1] (Northeast)												
November-June	2.54	15.73	5.58	13.50	5.87	15.73	12.68	9.48	6.85	4.89	3.20	3.97
July-October	3.85	16.67	11.11	12.45	8.65	14.98	10.44	7.60	5.31	3.53	2.53	2.90
Region 2: (Midwest)												
November-June	3.71	17.16	6.82	13.72	6.54	15.58	11.82	8.78	5.89	3.86	2.66	3.45
July-October	5.40	17.26	9.99	12.37	7.99	14.66	10.97	7.45	5.36	3.45	2.21	2.90
Region 3: (South)												
November-June	3.74	14.77	7.64	12.39	6.97	15.71	12.09	9.03	6.43	4.50	2.87	3.87
July-October	4.33	14.04	10.36	11.46	9.05	15.34	11.82	8.43	5.64	3.96	2.49	3.09
Region 4: (West)												
November-June	4.39	15.18	6.42	12.75	6.36	15.23	12.35	9.23	6.61	4.47	3.01	4.01
July-October	5.10	17.42	8.72	12.41	7.44	15.07	10.94	8.10	5.57	3.73	2.35	3.14
BROWN SWISS												
Region 1:[1] (N.E.and West)												
November-June	.61	10.61	7.76	9.52	8.02	15.61	12.81	10.27	7.67	5.88	4.23	7.02
July-October	.92	11.96	12.99	9.74	10.38	14.07	10.92	8.33	6.76	4.71	3.44	5.79
Region 2: (Midwest)												
November-June	1.01	12.60	8.45	10.46	8.41	15.52	12.37	9.60	7.33	5.26	3.60	5.41
July-October	1.08	11.53	14.08	9.95	10.90	14.87	10.93	8.11	6.16	4.43	3.14	4.83
Region 3: (South)												
November-June	1.00	10.52	9.33	9.93	8.81	16.02	12.21	10.43	7.49	5.16	3.81	5.31
July-October	.78	10.43	12.65	10.55	11.41	16.57	11.60	8.50	6.18	3.98	2.61	4.74
MILKING SHORTHORN												
Region 1:[1] (Nationwide)												
November-June	2.03	14.32	9.83	11.77	8.43	15.34	11.81	8.69	6.47	4.42	2.82	4.08
July-October	2.27	12.04	14.24	10.54	10.82	15.58	11.31	7.83	5.44	3.66	2.72	3.57
RED DANE												
Region 1:[1] (Nationwide)												
November-June	.25	18.23	15.44	13.92	10.13	16.20	10.38	6.33	4.56	3.29	1.01	.25
July-October	2.22	14.13	21.05	16.34	12.47	14.68	10.80	4.16	1.94	.55	1.39	.28
RED POLL												
Region 1:[1] (Nationwide)												
November-June	1.25	7.19	6.25	11.25	7.50	16.88	13.13	12.19	7.19	7.19	5.00	5.00
July-October	2.44	7.32	6.71	8.54	9.15	15.85	11.59	13.42	9.15	4.27	6.10	5.49

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[1] See table 1 for grouping of States into regions for the various breeds.

TABLE 3.--Number of lactations used in developing age adjustment factors by breed, region, and aeason

Breed 1/	Season of calving	Region 2/ I	II	III	IV	V	VI
Ayrshire	November through June	67,753	25,958	14,154			
	July through October	48,998	19,082	12,447			
Guernsey	November through June	42,969	57,520	36,639	50,522		
	July through October	23,489	32,450	24,722	28,520		
Holstein	November through June	91,883	78,968	222,032	42,638	82,084	16,429
	July through October	68,869	49,064	153,263	37,342	51,688	9,146
Jersey	November through June	21,958	22,601	42,242	60,217		
	July through October	13,664	13,438	29,619	31,260		
Brown Swiss	November through June	27,199	73,199	6,799			
	July through October	16,250	43,671	5,129			
M. Shorthorn	November through June	23,779					
	July through October	15,026					
Red Dane	November through June	395					
	July through October	361					
Red Poll	November through June	320					
	July through October	164					

1/ The total number of records available by breed were: Ayrshire, 188,392; Guernsey, 296,831; Holstein, 903,406; Jersey, 234,999; Brown Swiss, 172,247.
2/ See table 1 for the States in each region.

TABLE 4.--Age and yield of milk and fat during 2-year interval of maximum (mature) production by breed, region, and season

Breed	Region 1/	General area	November through June		July through October		November through June		July through October	
			Age at start of 2-year interval of highest (mature) yield	Milk yield	Age at start of 2-year interval of highest (mature) yield	Milk yield	Age at start of 2-year interval of highest (mature) yield	Milk yield	Age at start of 2-year interval of highest (mature) yield	Milk yield
			Yr. and mo.	Lb.	Yr. and mo.	Lb.	Yr. and mo.	Lb.	Yr. and mo.	Lb.
yrshire	1	Northeast and West	7-3 2/	10,299	8-0	9,841	7-3	410	7-0	395
	2	Midwest	8-0	9,943	8-0	9,378	6-6	388	6-9	371
	3	South	7-6	9,737	7-0	8,919	7-6	381	7-9	350
uernsey	1	Northeast	7-0	8,972	6-0	8,450	6-0	421	6-0	404
	2	Midwest	7-0	8,942	7-6	8,402	6-3	422	6-6	403
	3	South	7-0	8,389	6-6	7,538	6-0	385	6-0	354
	4	West	8-0	9,505	7-6	9,030	6-3	451	6-6	438
olstein	1	Northeast	6-6	13,~~3~~868	6-9	13,456	6-3	501	6-0	487
	2	Middle Atlantic	6-9	13,016	6-3	12,624	6-3	477	6-0	466
	3	Midwest	6-3	13,196	6-0	12,537	6-3	473	6-0	453
	4	South	8-0	12,901	6-9	11,966	6-3	464	6-0	432
	5	West	6-9	14,092	6-9	13,446	6-3	497	6-0	481
	6	California	7-0	16,141	6-6	15,452	6-6	571	7-0	552
ersey	1	Northeast	6-3	8,738	7-3	8,266	6-0	453	6-0	432
	2	Midwest	6-3	8,249	7-0	7,539	6-0	424	6-9	393
	3	South	6-0	7,957	6-0	7,185	6-0	397	6-0	363
	4	West	7-9	8,902	7-9	8,378	7-9	469	6-6	447
rown Swiss	1	Northeast and West	8-0	11,602	6-9	11,327	6-6	470	6-9	465
	2	Midwest	7-3	11,232	7-6	10,754	6-0	447	6-6	436
	3	South	7-3	10,992	6-6	10,133	7-0	436	6-6	404
. Shorthorn	1	Nationwide	8-0	8,824	8-0	8,058	8-0	330	8-0	304
ed Dane	1	Nationwide	7-6	11,975	6-9	11,326	7-6	490	6-9	444
ed Poll	1	Nationwide	6-3	7,370	8-0	6,695	6-3	300	8-0	281

/ See table 1 for the States in each breed region.
2/ The period of mature production is defined as the 2-year period of highest yield and includes the next 2 years above the age shown. or instance, the period for highest milk yield of Ayrshires calving from November through June in the Northeast and West was 7 years 3 months to 9 years 2 months. For Ayrshires calving from July through October in same area it was 8-0 to 9-11.

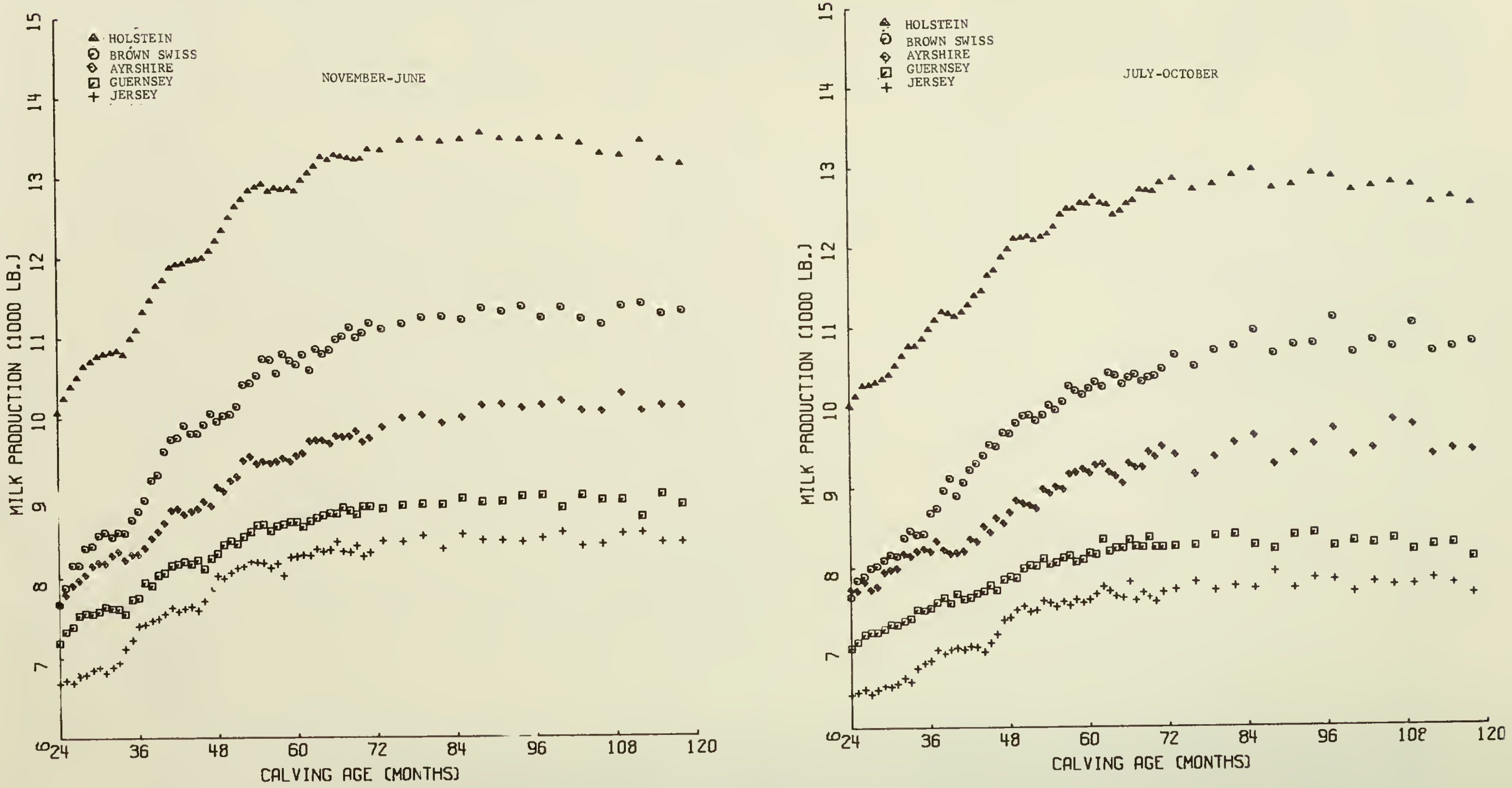

Figure 1.--Relationship between age and milk yield by breed and season.

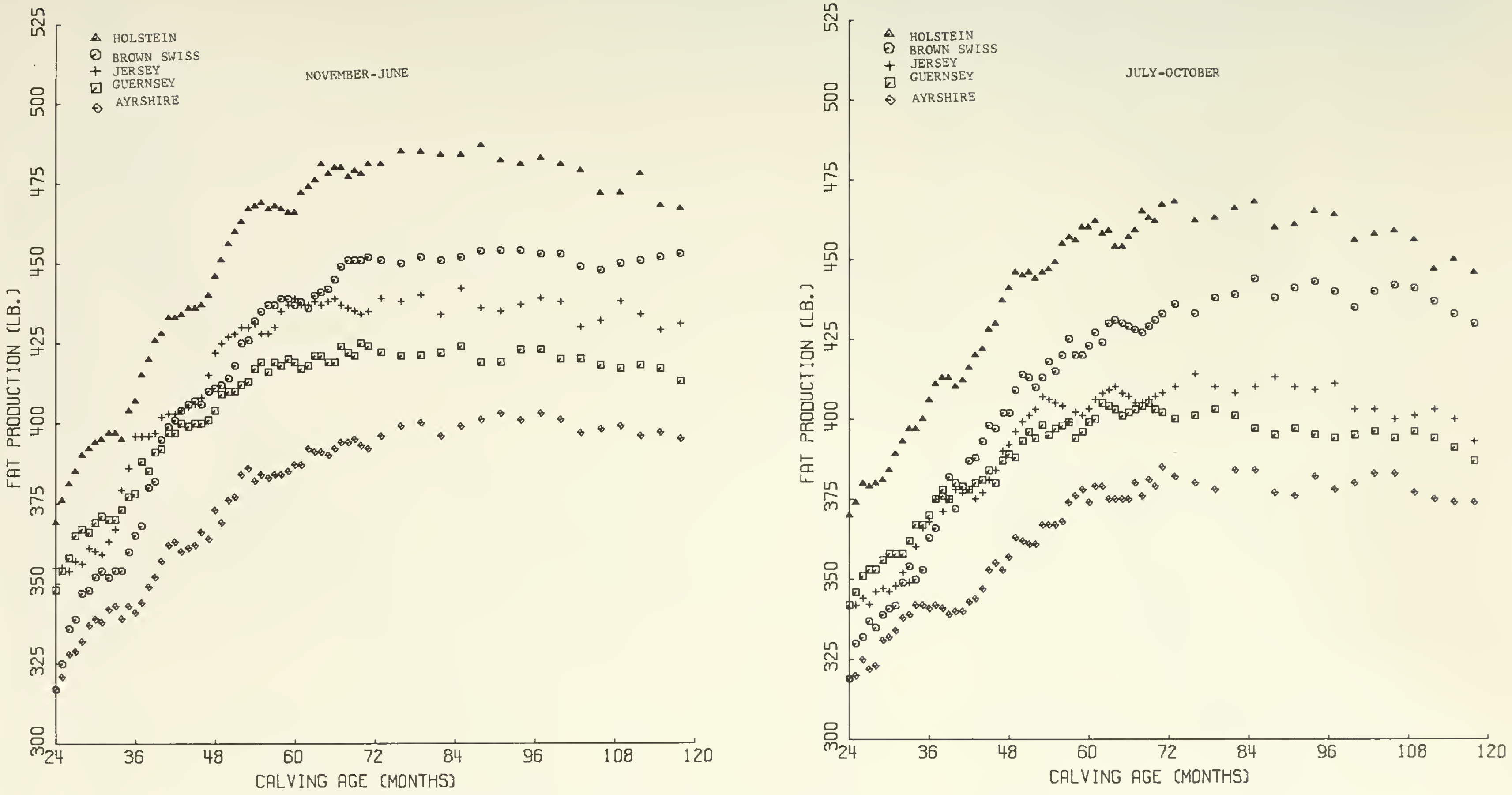

Figure 2.--Relationship between age and fat yield by breed and season.

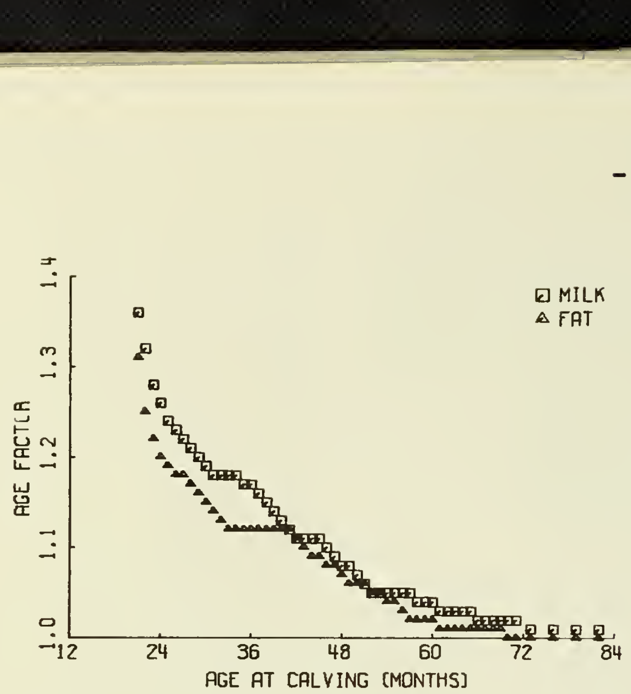

Figure 3.--Age adjustment factors for milk and fat yields of Ayrshire cows calving in July-October.

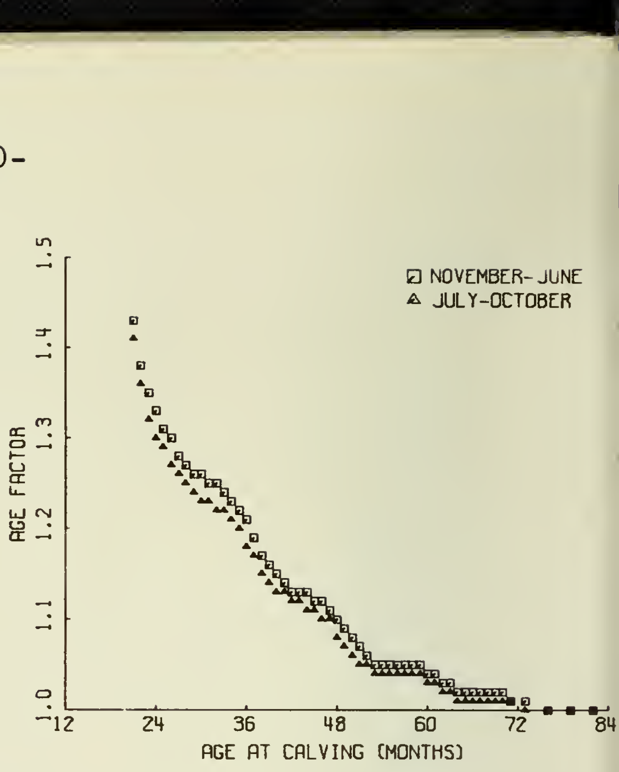

Figure 4.--Age adjustment factor for the milk yields of Holstei cows calving in different seasons.

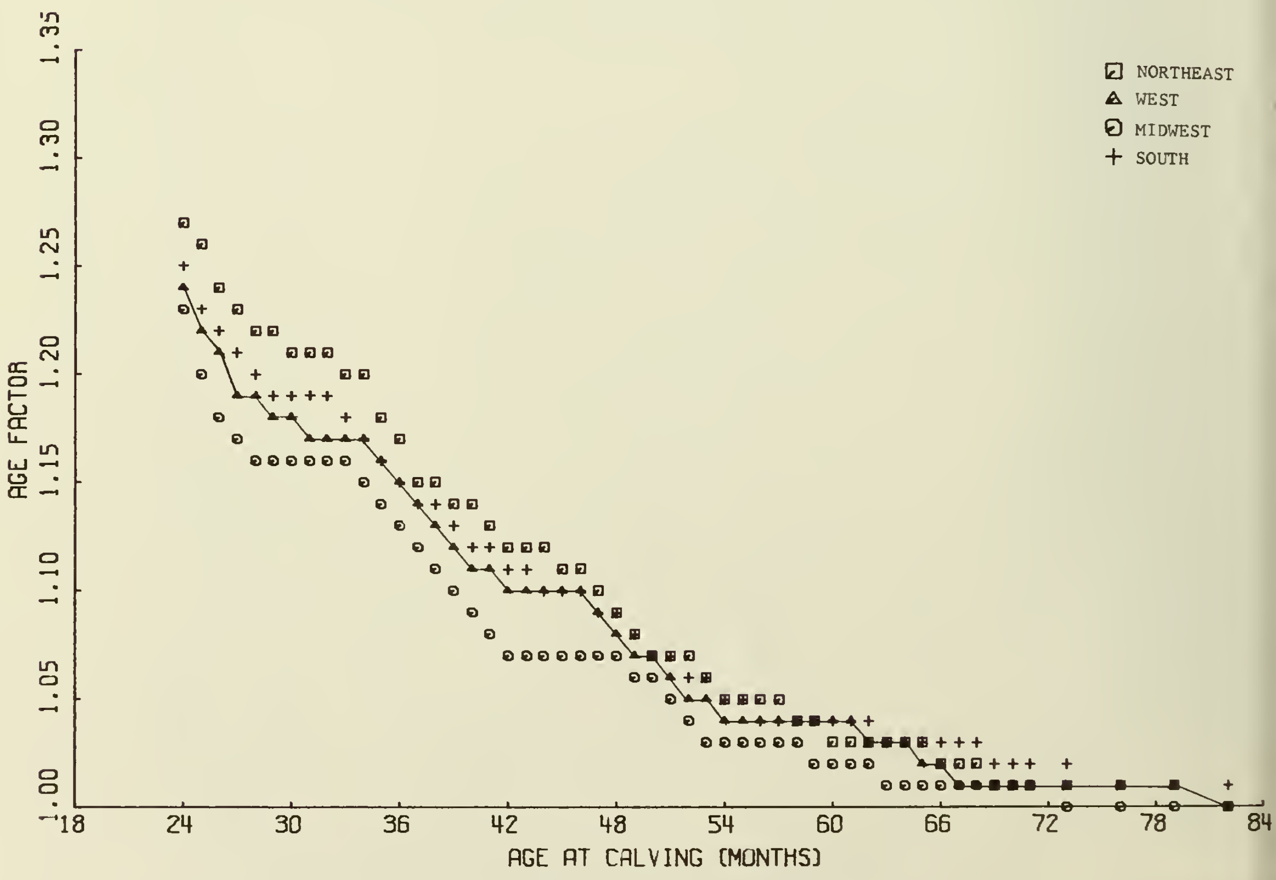

Figure 5.--Age adjustment factors for the milk yields of Guernsey cows calving in different regions of the United States.

TABLE 5.--AYRSHIRE AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Idaho, Wyoming, Montana, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, and Hawaii 1/

Age in years and months	Adjustment factors by season of calving			
	November to June		July to October	
	Milk	Fat	Milk	Fat
1-9	1.45	1.38	1.35	1.30
1-10	1.39	1.31	1.31	1.26
1-11	1.35	1.28	1.28	1.24
2-0	1.33	1.26	1.27	1.22
2-1	1.31	1.25	1.26	1.22
2-2	1.30	1.24	1.26	1.21
2-3	1.29	1.23	1.25	1.20
2-4	1.28	1.22	1.24	1.19
2-5	1.27	1.21	1.23	1.18
2-6	1.26	1.20	1.22	1.17
2-7	1.25	1.20	1.21	1.16
2-8	1.24	1.19	1.20	1.15
2-9	1.24	1.19	1.19	1.14
2-10	1.24	1.19	1.18	1.13
2-11	1.24	1.19	1.17	1.13
3-0	1.23	1.18	1.17	1.13
3-1	1.21	1.17	1.17	1.13
3-2	1.20	1.15	1.17	1.13
3-3	1.19	1.14	1.17	1.13
3-4	1.17	1.13	1.17	1.13
3-5	1.16	1.12	1.16	1.13
3-6	1.15	1.11	1.15	1.12
3-7	1.15	1.11	1.14	1.11
3-8	1.15	1.11	1.13	1.10
3-9	1.14	1.11	1.13	1.09
3-10	1.14	1.10	1.12	1.08
3-11	1.13	1.09	1.11	1.08
4-0	1.12	1.08	1.10	1.07
4-1	1.11	1.08	1.09	1.06
4-2	1.10	1.07	1.09	1.06
4-3	1.09	1.06	1.09	1.06
4-4	1.08	1.05	1.09	1.06
4-5	1.08	1.05	1.08	1.05
4-6	1.08	1.05	1.07	1.05
4-7	1.08	1.05	1.07	1.04
4-8	1.07	1.05	1.06	1.03
4-9	1.07	1.04	1.05	1.02
4-10	1.07	1.04	1.04	1.02
4-11	1.07	1.04	1.04	1.02
5-0	1.06	1.04	1.04	1.02
5-1	1.06	1.04	1.04	1.02
5-2	1.05	1.03	1.04	1.02
5-3	1.04	1.02	1.04	1.02
5-4	1.04	1.02	1.04	1.02
5-5	1.04	1.02	1.04	1.02
5-6	1.04	1.02	1.04	1.02
5-7	1.04	1.02	1.03	1.01
5-8	1.04	1.02	1.03	1.01
5-9	1.04	1.02	1.02	1.00
5-10	1.04	1.02	1.02	1.00
5-11	1.03	1.01	1.02	1.00
6-0 to 6-2	1.02	1.01	1.02	1.00
6-3 to 6-5	1.02	1.01	1.02	1.00
6-6 to 6-8	1.02	1.01	1.02	1.00
6-9 to 6-11	1.02	1.01	1.01	1.00
7-0 to 7-2	1.01	1.01	1.01	1.00
7-3 to 7-5	1.01	1.00	1.01	1.00
7-6 to 7-8	1.00	1.00	1.01	1.00
7-9 to 7-11	1.00	1.00	1.01	1.00
8-0 to 8-2	1.00	1.00	1.00	1.00
8-3 to 8-5	1.00	1.00	1.00	1.00
8-6 to 8-8	1.00	1.00	1.00	1.00
8-9 to 8-11	1.00	1.00	1.00	1.00
9-0 to 9-2	1.00	1.00	1.00	1.00
9-3 to 9-5	1.00	1.00	1.00	1.01
9-6 to 9-8	1.01	1.01	1.01	1.02
9-9 to 9-11	1.01	1.02	1.01	1.02
10-0 to 10-2	1.01	1.02	1.01	1.02
10-3 to 10-5	1.02	1.03	1.01	1.03
10-6 to 10-8	1.02	1.03	1.01	1.03
10-9 to 10-11	1.02	1.03	1.01	1.03
11-0 to 11-2	1.03	1.04	1.02	1.03
11-3 to 11-5	1.03	1.04	1.02	1.03
11-6 to 11-8	1.03	1.04	1.02	1.03
11-9 to 11-11	1.03	1.05	1.02	1.04
12-0 to 12-2	1.03	1.05	1.02	1.04
12-3 to 12-5	1.04	1.05	1.02	1.05
12-6 to 12-8	1.04	1.05	1.03	1.05
12-9 to 12-11	1.04	1.06	1.03	1.06
13-0 to 13-2	1.04	1.06	1.03	1.06
13-3 to 13-5	1.05	1.07	1.04	1.07
13-6 to 13-8	1.05	1.07	1.05	1.07
13-9 to 13-11	1.06	1.08	1.06	1.08
14-0 and up	1.07	1.09	1.08	1.10

1/ These factors were based on 67,753 records of cows that calved from November through June and on 48,998 records of those that calved from July through October.

TABLE 6.--AYRSHIRE AGE ADJUSTMENT FACTORS for milk and fat production:for cows that calve in Indiana, Illinois, Ohio, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.35	1.31	1.34	1.29	5-3	1.04	1.03	1.04	1.02
1-10	1.33	1.28	1.28	1.23	5-4	1.04	1.03	1.04	1.02
1-11	1.30	1.25	1.25	1.19	5-5	1.04	1.03	1.04	1.02
2-0	1.28	1.22	1.22	1.17	5-6	1.03	1.02	1.04	1.02
2-1	1.26	1.20	1.21	1.15	5-7	1.03	1.02	1.04	1.01
2-2	1.25	1.19	1.19	1.14	5-8	1.03	1.02	1.03	1.01
2-3	1.24	1.18	1.19	1.14	5-9	1.03	1.02	1.02	1.01
2-4	1.23	1.17	1.19	1.14	5-10	1.03	1.02	1.02	1.01
2-5	1.21	1.16	1.19	1.14	5-11	1.03	1.02	1.02	1.01
2-6	1.20	1.15	1.18	1.13	6-0 to 6-2	1.02	1.01	1.02	1.01
2-7	1.19	1.14	1.18	1.12	6-3 to 6-5	1.02	1.01	1.02	1.01
2-8	1.19	1.14	1.17	1.11	6-6 to 6-8	1.01	1.00	1.01	1.00
2-9	1.19	1.13	1.16	1.11	6-9 to 6-11	1.01	1.00	1.00	1.00
2-10	1.19	1.13	1.16	1.10	7-0 to 7-2	1.00	1.00	1.00	1.00
2-11	1.19	1.13	1.15	1.10	7-3 to 7-5	1.00	1.00	1.00	1.00
3-0	1.19	1.13	1.15	1.10	7-6 to 7-8	1.00	1.00	1.00	1.00
3-1	1.19	1.13	1.15	1.10	7-9 to 7-11	1.00	1.00	1.00	1.00
3-2	1.18	1.13	1.15	1.10	8-0 to 8-2	1.00	1.00	1.00	1.00
3-3	1.17	1.12	1.15	1.10	8-3 to 8-5	1.00	1.01	1.00	1.00
3-4	1.16	1.11	1.15	1.10	8-6 to 8-8	1.00	1.01	1.00	1.00
3-5	1.15	1.11	1.15	1.10	8-9 to 8-11	1.01	1.01	1.00	1.00
3-6	1.14	1.10	1.15	1.10	9-0 to 9-2	1.01	1.01	1.00	1.00
3-7	1.14	1.10	1.15	1.10	9-3 to 9-5	1.01	1.01	1.00	1.01
3-8	1.14	1.10	1.14	1.10	9-6 to 9-8	1.01	1.02	1.01	1.01
3-9	1.14	1.10	1.13	1.09	9-9 to 9-11	1.01	1.02	1.01	1.02
3-10	1.13	1.09	1.12	1.08	10-0 to 10-2	1.01	1.02	1.02	1.02
3-11	1.13	1.09	1.12	1.08	10-3 to 10-5	1.02	1.03	1.02	1.02
4-0	1.12	1.08	1.11	1.07	10-6 to 10-8	1.02	1.03	1.02	1.02
4-1	1.11	1.07	1.10	1.06	10-9 to 10-11	1.02	1.03	1.02	1.02
4-2	1.10	1.06	1.09	1.05	11-0 to 11-2	1.03	1.04	1.02	1.02
4-3	1.09	1.06	1.08	1.05	11-3 to 11-5	1.03	1.04	1.02	1.02
4-4	1.08	1.05	1.08	1.05	11-6 to 11-8	1.03	1.04	1.02	1.02
4-5	1.07	1.04	1.08	1.05	11-9 to 11-11	1.04	1.05	1.02	1.02
4-6	1.07	1.04	1.07	1.04	12-0 to 12-2	1.04	1.05	1.02	1.02
4-7	1.07	1.04	1.06	1.03	12-3 to 12-5	1.05	1.06	1.02	1.02
4-8	1.07	1.04	1.05	1.03	12-6 to 12-8	1.05	1.06	1.02	1.02
4-9	1.07	1.04	1.05	1.02	12-9 to 12-11	1.06	1.07	1.02	1.02
4-10	1.07	1.04	1.05	1.02	13-0 to 13-2	1.06	1.08	1.02	1.02
4-11	1.07	1.04	1.05	1.02	13-3 to 13-5	1.06	1.08	1.02	1.02
5-0	1.06	1.03	1.05	1.02	13-6 to 13-8	1.07	1.09	1.02	1.02
5-1	1.05	1.03	1.04	1.02	13-9 to 13-11	1.07	1.09	1.02	1.02
5-2	1.05	1.03	1.04	1.02	14-0 and up	1.08	1.10	1.04	1.04

1/ These factors were based on 25,958 records of cows that calved from November through June and on 19,082 records of those that calved from July through October.

TABLE 7.--AYRSHIRE AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, and Texas 1/

Age in years and months	Adjustment factors by season of calving			
	November to June		July to October	
	Milk	Fat	Milk	Fat
1-9	1.41	1.36	1.28	1.23
1-10	1.38	1.33	1.24	1.20
1-11	1.35	1.30	1.21	1.17
2-0	1.32	1.27	1.20	1.16
2-1	1.29	1.24	1.20	1.16
2-2	1.26	1.21	1.20	1.16
2-3	1.25	1.19	1.20	1.15
2-4	1.24	1.18	1.19	1.14
2-5	1.23	1.18	1.19	1.13
2-6	1.23	1.17	1.18	1.13
2-7	1.22	1.17	1.17	1.12
2-8	1.22	1.16	1.16	1.11
2-9	1.22	1.16	1.16	1.10
2-10	1.22	1.16	1.16	1.10
2-11	1.21	1.16	1.16	1.10
3-0	1.20	1.15	1.16	1.10
3-1	1.19	1.14	1.16	1.10
3-2	1.18	1.13	1.16	1.10
3-3	1.17	1.13	1.16	1.10
3-4	1.16	1.12	1.16	1.10
3-5	1.15	1.11	1.16	1.10
3-6	1.14	1.10	1.16	1.10
3-7	1.14	1.10	1.15	1.10
3-8	1.14	1.10	1.14	1.10
3-9	1.14	1.10	1.14	1.09
3-10	1.14	1.10	1.13	1.09
3-11	1.13	1.10	1.12	1.08
4-0	1.12	1.09	1.12	1.07
4-1	1.11	1.08	1.11	1.07
4-2	1.10	1.06	1.11	1.07
4-3	1.08	1.05	1.10	1.06
4-4	1.07	1.04	1.10	1.06
4-5	1.07	1.04	1.09	1.06
4-6	1.07	1.04	1.08	1.05
4-7	1.07	1.04	1.07	1.05
4-8	1.07	1.04	1.07	1.05
4-9	1.07	1.04	1.07	1.04
4-10	1.07	1.04	1.05	1.03
4-11	1.07	1.04	1.05	1.02
5-0	1.07	1.04	1.05	1.02
5-1	1.06	1.03	1.05	1.02
5-2	1.06	1.03	1.05	1.02
5-3	1.06	1.03	1.05	1.02
5-4	1.06	1.03	1.05	1.02
5-5	1.06	1.03	1.05	1.02
5-6	1.05	1.03	1.05	1.02
5-7	1.05	1.03	1.04	1.02
5-8	1.05	1.03	1.03	1.01
5-9	1.05	1.03	1.03	1.01
5-10	1.05	1.03	1.03	1.01
5-11	1.04	1.03	1.02	1.01
6-0 to 6-2	1.03	1.02	1.02	1.00
6-3 to 6-5	1.03	1.02	1.02	1.00
6-6 to 6-8	1.03	1.01	1.02	1.00
6-9 to 6-11	1.03	1.01	1.01	1.00
7-0 to 7-2	1.02	1.01	1.00	1.00
7-3 to 7-5	1.01	1.01	1.00	1.00
7-6 to 7-8	1.00	1.00	1.00	1.00
7-9 to 7-11	1.00	1.00	1.00	1.00
8-0 to 8-2	1.00	1.00	1.00	1.00
8-3 to 8-5	1.00	1.00	1.00	1.00
8-6 to 8-8	1.00	1.00	1.00	1.01
8-9 to 8-11	1.00	1.00	1.00	1.01
9-0 to 9-2	1.00	1.00	1.00	1.01
9-3 to 9-5	1.00	1.01	1.01	1.02
9-6 to 9-8	1.00	1.01	1.01	1.02
9-9 to 9-11	1.00	1.02	1.01	1.02
10-0 to 10-2	1.00	1.02	1.02	1.03
10-3 to 10-5	1.00	1.02	1.02	1.03
10-6 to 10-8	1.01	1.02	1.02	1.03
10-9 to 10-11	1.01	1.02	1.02	1.03
11-0 to 11-2	1.01	1.03	1.02	1.03
11-3 to 11-5	1.01	1.03	1.02	1.03
11-6 to 11-8	1.01	1.03	1.02	1.03
11-9 to 11-11	1.01	1.03	1.02	1.03
12-0 to 12-2	1.01	1.03	1.03	1.03
12-3 to 12-5	1.02	1.04	1.03	1.04
12-6 to 12-8	1.02	1.04	1.04	1.04
12-9 to 12-11	1.02	1.04	1.04	1.05
13-0 to 13-2	1.02	1.05	1.05	1.06
13-3 to 13-5	1.02	1.06	1.05	1.07
13-6 to 13-8	1.03	1.07	1.06	1.08
13-9 to 13-11	1.03	1.08	1.07	1.09
14-0 and up	1.04	1.09	1.08	1.10

1/ These factors were based on 14,154 records of cows that calved from November through June and on 12,447 records of those that calved from July through October.

TABLE 8.--GUERNSEY AGE ADJUSTMENT FACTORS for milk and fat production:for cows that calve in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.40	1.36	1.32	1.29	5-3	1.03	1.01	1.01	1.00
1-10	1.33	1.29	1.26	1.23	5-4	1.03	1.01	1.01	1.00
1-11	1.29	1.26	1.23	1.20	5-5	1.03	1.01	1.01	1.00
2-0	1.27	1.23	1.21	1.19	5-6	1.02	1.01	1.00	1.00
2-1	1.26	1.22	1.21	1.18	5-7	1.02	1.00	1.00	1.00
2-2	1.24	1.20	1.21	1.18	5-8	1.02	1.00	1.00	1.00
2-3	1.23	1.19	1.20	1.18	5-9	1.01	1.00	1.00	1.00
2-4	1.22	1.18	1.19	1.17	5-10	1.01	1.00	1.00	1.00
2-5	1.22	1.18	1.18	1.16	5-11	1.01	1.00	1.00	1.00
2-6	1.21	1.18	1.17	1.15	6-0 to 6-2	1.01	1.00	1.00	1.00
2-7	1.21	1.17	1.16	1.14	6-3 to 6-5	1.01	1.00	1.00	1.00
2-8	1.21	1.17	1.15	1.13	6-6 to 6-8	1.01	1.00	1.00	1.00
2-9	1.20	1.16	1.14	1.12	6-9 to 6-11	1.00	1.00	1.00	1.00
2-10	1.20	1.16	1.14	1.12	7-0 to 7-2	1.00	1.00	1.00	1.00
2-11	1.18	1.14	1.14	1.11	7-3 to 7-5	1.00	1.00	1.00	1.00
3-0	1.17	1.12	1.13	1.10	7-6 to 7-8	1.00	1.00	1.00	1.00
3-1	1.15	1.11	1.12	1.09	7-9 to 7-11	1.00	1.00	1.00	1.00
3-2	1.15	1.11	1.11	1.08	8-0 to 8-2	1.00	1.00	1.00	1.01
3-3	1.14	1.10	1.11	1.07	8-3 to 8-5	1.00	1.01	1.01	1.02
3-4	1.14	1.10	1.11	1.07	8-6 to 8-8	1.00	1.01	1.01	1.03
3-5	1.13	1.09	1.11	1.07	8-9 to 8-11	1.00	1.01	1.01	1.03
3-6	1.12	1.08	1.10	1.07	9-0 to 9-2	1.00	1.01	1.01	1.03
3-7	1.12	1.08	1.09	1.06	9-3 to 9-5	1.01	1.02	1.01	1.03
3-8	1.12	1.08	1.08	1.05	9-6 to 9-8	1.01	1.02	1.01	1.03
3-9	1.11	1.07	1.07	1.04	9-9 to 9-11	1.01	1.03	1.01	1.03
3-10	1.11	1.07	1.07	1.04	10-0 to 10-2	1.01	1.03	1.01	1.03
3-11	1.10	1.06	1.06	1.03	10-3 to 10-5	1.01	1.03	1.01	1.03
4-0	1.09	1.05	1.05	1.03	10-6 to 10-8	1.01	1.03	1.01	1.03
4-1	1.08	1.04	1.04	1.02	10-9 to 10-11	1.01	1.03	1.01	1.03
4-2	1.07	1.04	1.04	1.02	11-0 to 11-2	1.02	1.04	1.01	1.04
4-3	1.07	1.04	1.04	1.01	11-3 to 11-5	1.02	1.04	1.01	1.04
4-4	1.07	1.04	1.04	1.01	11-6 to 11-8	1.02	1.05	1.01	1.05
4-5	1.06	1.04	1.04	1.01	11-9 to 11-11	1.02	1.05	1.01	1.05
4-6	1.05	1.03	1.04	1.01	12-0 to 12-2	1.03	1.05	1.02	1.06
4-7	1.05	1.02	1.03	1.01	12-3 to 12-5	1.03	1.06	1.02	1.06
4-8	1.05	1.02	1.03	1.01	12-6 to 12-8	1.03	1.06	1.03	1.07
4-9	1.05	1.02	1.02	1.01	12-9 to 12-11	1.04	1.06	1.03	1.08
4-10	1.04	1.01	1.02	1.00	13-0 to 13-2	1.04	1.07	1.04	1.08
4-11	1.04	1.01	1.02	1.00	13-3 to 13-5	1.04	1.07	1.05	1.09
5-0	1.03	1.01	1.01	1.00	13-6 to 13-8	1.05	1.07	1.06	1.10
5-1	1.03	1.01	1.01	1.00	13-9 to 13-11	1.05	1.07	1.07	1.11
5-2	1.03	1.01	1.01	1.00	14-0 and up	1.06	1.08	1.09	1.13

1/ These factors were based on 42,969 records of cows that calved from November through June and on 23,489 records of those that calved from July through October.

TABLE 9.--GUERNSEY AGE ADJUSTMENT FACTORS for milk and fat production:for cows that calve in Indiana, Illinois, Ohio, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.36	1.32	1.26	1.23	5-3	1.03	1.01	1.02	1.00
1-10	1.30	1.26	1.22	1.19	5-4	1.03	1.01	1.02	1.00
1-11	1.26	1.23	1.20	1.17	5-5	1.02	1.01	1.02	1.00
2-0	1.24	1.21	1.19	1.16	5-6	1.02	1.01	1.02	1.00
2-1	1.22	1.19	1.18	1.16	5-7	1.01	1.00	1.01	1.00
2-2	1.21	1.18	1.18	1.15	5-8	1.01	1.00	1.01	1.00
2-3	1.19	1.17	1.17	1.14	5-9	1.01	1.00	1.01	1.00
2-4	1.19	1.16	1.16	1.14	5-10	1.01	1.00	1.01	1.00
2-5	1.18	1.15	1.16	1.13	5-11	1.01	1.00	1.01	1.00
2-6	1.18	1.14	1.15	1.12	6-0 to 6-2	1.01	1.00	1.01	1.00
2-7	1.17	1.14	1.14	1.11	6-3 to 6-5	1.01	1.00	1.01	1.00
2-8	1.17	1.14	1.14	1.10	6-6 to 6-8	1.01	1.00	1.01	1.00
2-9	1.17	1.14	1.13	1.09	6-9 to 6-11	1.00	1.00	1.01	1.00
2-10	1.17	1.14	1.12	1.08	7-0 to 7-2	1.00	1.00	1.00	1.00
2-11	1.16	1.13	1.11	1.07	7-3 to 7-5	1.00	1.00	1.00	1.00
3-0	1.15	1.12	1.11	1.07	7-6 to 7-8	1.00	1.00	1.00	1.00
3-1	1.14	1.11	1.11	1.07	7-9 to 7-11	1.00	1.00	1.00	1.00
3-2	1.13	1.10	1.11	1.07	8-0 to 8-2	1.00	1.00	1.00	1.00
3-3	1.12	1.09	1.11	1.07	8-3 to 8-5	1.00	1.01	1.00	1.00
3-4	1.11	1.08	1.11	1.07	8-6 to 8-8	1.00	1.01	1.00	1.00
3-5	1.11	1.07	1.11	1.07	8-9 to 8-11	1.01	1.02	1.00	1.00
3-6	1.10	1.06	1.10	1.06	9-0 to 9-2	1.01	1.02	1.00	1.01
3-7	1.10	1.06	1.09	1.05	9-3 to 9-5	1.01	1.02	1.01	1.02
3-8	1.10	1.06	1.08	1.04	9-6 to 9-8	1.01	1.02	1.02	1.03
3-9	1.10	1.06	1.08	1.04	9-9 to 9-11	1.01	1.03	1.03	1.04
3-10	1.10	1.06	1.07	1.03	10-0 to 10-2	1.01	1.03	1.03	1.04
3-11	1.09	1.06	1.06	1.03	10-3 to 10-5	1.01	1.03	1.03	1.05
4-0	1.08	1.05	1.06	1.02	10-6 to 10-8	1.01	1.04	1.03	1.05
4-1	1.07	1.04	1.06	1.02	10-9 to 10-11	1.01	1.04	1.03	1.05
4-2	1.07	1.04	1.05	1.02	11-0 to 11-2	1.02	1.04	1.03	1.05
4-3	1.06	1.03	1.05	1.02	11-3 to 11-5	1.02	1.05	1.03	1.05
4-4	1.05	1.03	1.05	1.01	11-6 to 11-8	1.02	1.05	1.03	1.05
4-5	1.05	1.02	1.04	1.01	11-9 to 11-11	1.02	1.06	1.04	1.06
4-6	1.04	1.02	1.04	1.01	12-0 to 12-2	1.03	1.06	1.04	1.06
4-7	1.04	1.02	1.03	1.00	12-3 to 12-5	1.03	1.07	1.04	1.07
4-8	1.04	1.02	1.03	1.00	12-6 to 12-8	1.03	1.07	1.04	1.07
4-9	1.04	1.02	1.03	1.00	12-9 to 12-11	1.04	1.07	1.05	1.08
4-10	1.04	1.02	1.03	1.00	13-0 to 13-2	1.04	1.07	1.06	1.09
4-11	1.04	1.02	1.03	1.00	13-3 to 13-5	1.04	1.07	1.07	1.10
5-0	1.04	1.02	1.03	1.00	13-6 to 13-8	1.04	1.08	1.08	1.11
5-1	1.04	1.01	1.02	1.00	13-9 to 13-11	1.05	1.08	1.09	1.13
5-2	1.03	1.01	1.02	1.00	14-0 and up	1.05	1.08	1.11	1.15

1/ These factors were based on 57,520 records of cows that calved from November through June and on 32,450 records of those that calved from July through October.

TABLE 10.-GUERNSEY AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, and Texas 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.35	1.30	1.23	1.20	5-3	1.01	1.00	1.01	1.00
1-10	1.31	1.26	1.21	1.18	5-4	1.01	1.00	1.01	1.00
1-11	1.26	1.22	1.19	1.16	5-5	1.01	1.00	1.01	1.00
2-0	1.23	1.18	1.17	1.14	5-6	1.01	1.00	1.01	1.00
2-1	1.20	1.16	1.15	1.12	5-7	1.01	1.00	1.01	1.00
2-2	1.18	1.14	1.13	1.10	5-8	1.01	1.00	1.00	1.00
2-3	1.17	1.13	1.12	1.09	5-9	1.01	1.00	1.00	1.00
2-4	1.16	1.12	1.12	1.08	5-10	1.01	1.00	1.00	1.00
2-5	1.16	1.12	1.12	1.08	5-11	1.01	1.00	1.00	1.00
2-6	1.16	1.11	1.12	1.08	6-0 to 6-2	1.00	1.00	1.00	1.00
2-7	1.16	1.11	1.12	1.08	6-3 to 6-5	1.00	1.00	1.00	1.00
2-8	1.16	1.11	1.11	1.08	6-6 to 6-8	1.00	1.00	1.00	1.00
2-9	1.16	1.11	1.10	1.07	6-9 to 6-11	1.00	1.00	1.00	1.00
2-10	1.15	1.10	1.09	1.06	7-0 to 7-2	1.00	1.00	1.00	1.00
2-11	1.14	1.09	1.09	1.05	7-3 to 7-5	1.00	1.00	1.00	1.01
3-0	1.13	1.08	1.09	1.05	7-6 to 7-8	1.00	1.00	1.01	1.02
3-1	1.12	1.07	1.09	1.05	7-9 to 7-11	1.00	1.01	1.01	1.02
3-2	1.11	1.06	1.09	1.05	8-0 to 8-2	1.00	1.01	1.01	1.02
3-3	1.10	1.05	1.08	1.04	8-3 to 8-5	1.00	1.01	1.01	1.02
3-4	1.09	1.04	1.07	1.03	8-6 to 8-8	1.00	1.01	1.02	1.03
3-5	1.08	1.03	1.07	1.03	8-9 to 8-11	1.01	1.02	1.02	1.04
3-6	1.07	1.03	1.07	1.03	9-0 to 9-2	1.01	1.02	1.03	1.04
3-7	1.07	1.03	1.07	1.03	9-3 to 9-5	1.01	1.03	1.03	1.04
3-8	1.07	1.03	1.06	1.03	9-6 to 9-8	1.01	1.03	1.03	1.05
3-9	1.07	1.03	1.06	1.02	9-9 to 9-11	1.02	1.04	1.04	1.05
3-10	1.07	1.03	1.06	1.02	10-0 to 10-2	1.02	1.04	1.04	1.06
3-11	1.07	1.03	1.05	1.02	10-3 to 10-5	1.03	1.05	1.04	1.06
4-0	1.07	1.03	1.05	1.02	10-6 to 10-8	1.03	1.05	1.05	1.07
4-1	1.06	1.02	1.05	1.02	10-9 to 10-11	1.03	1.06	1.05	1.07
4-2	1.06	1.02	1.05	1.02	11-0 to 11-2	1.04	1.06	1.05	1.08
4-3	1.05	1.02	1.05	1.02	11-3 to 11-5	1.04	1.07	1.06	1.08
4-4	1.04	1.01	1.05	1.02	11-6 to 11-8	1.05	1.07	1.06	1.08
4-5	1.03	1.00	1.04	1.02	11-9 to 11-11	1.05	1.08	1.06	1.09
4-6	1.03	1.00	1.04	1.01	12-0 to 12-2	1.06	1.09	1.06	1.09
4-7	1.03	1.00	1.03	1.00	12-3 to 12-5	1.06	1.10	1.07	1.09
4-8	1.03	1.00	1.02	1.00	12-6 to 12-8	1.07	1.11	1.07	1.09
4-9	1.03	1.00	1.02	1.00	12-9 to 12-11	1.08	1.12	1.07	1.10
4-10	1.03	1.00	1.02	1.00	13-0 to 13-2	1.10	1.12	1.07	1.10
4-11	1.02	1.00	1.02	1.00	13-3 to 13-5	1.11	1.13	1.08	1.11
5-0	1.02	1.00	1.01	1.00	13-6 to 13-8	1.13	1.14	1.08	1.12
5-1	1.02	1.00	1.01	1.00	13-9 to 13-11	1.14	1.15	1.08	1.13
5-2	1.02	1.00	1.01	1.00	14-0 and up	1.16	1.18	1.09	1.14

1/ These factors were based on 36,639 records of cows that calved from November through June and on 24,722 records of those that calved from July through October.

TABLE 11. -GUERNSEY AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Idaho, Wyoming, Montana, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, and Hawaii 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.35	1.32	1.32	1.29	5-3	1.03	1.01	1.03	1.01
1-10	1.30	1.28	1.28	1.26	5-4	1.03	1.01	1.03	1.01
1-11	1.27	1.24	1.25	1.24	5-5	1.03	1.01	1.03	1.01
2-0	1.25	1.22	1.23	1.22	5-6	1.03	1.01	1.03	1.01
2-1	1.23	1.21	1.21	1.20	5-7	1.03	1.01	1.03	1.01
2-2	1.22	1.20	1.20	1.19	5-8	1.03	1.00	1.03	1.01
2-3	1.21	1.18	1.20	1.18	5-9	1.02	1.00	1.03	1.01
2-4	1.20	1.17	1.19	1.17	5-10	1.02	1.00	1.03	1.01
2-5	1.19	1.16	1.18	1.16	5-11	1.02	1.00	1.03	1.01
2-6	1.19	1.15	1.17	1.15	6-0 to 6-2	1.02	1.00	1.02	1.01
2-7	1.19	1.15	1.16	1.14	6-3 to 6-5	1.01	1.00	1.02	1.00
2-8	1.19	1.15	1.15	1.13	6-6 to 6-8	1.01	1.00	1.01	1.00
2-9	1.18	1.15	1.14	1.12	6-9 to 6-11	1.01	1.00	1.01	1.00
2-10	1.17	1.14	1.13	1.11	7-0 to 7-2	1.01	1.00	1.01	1.00
2-11	1.16	1.13	1.13	1.11	7-3 to 7-5	1.01	1.00	1.01	1.00
3-0	1.15	1.12	1.12	1.10	7-6 to 7-8	1.01	1.00	1.01	1.00
3-1	1.14	1.11	1.12	1.09	7-9 to 7-11	1.01	1.00	1.00	1.00
3-2	1.14	1.10	1.12	1.09	8-0 to 8-2	1.00	1.00	1.00	1.00
3-3	1.13	1.09	1.12	1.09	8-3 to 8-5	1.00	1.00	1.00	1.01
3-4	1.12	1.09	1.12	1.09	8-6 to 8-8	1.00	1.00	1.00	1.01
3-5	1.12	1.08	1.12	1.08	8-9 to 8-11	1.00	1.00	1.00	1.01
3-6	1.11	1.07	1.12	1.08	9-0 to 9-2	1.00	1.00	1.01	1.02
3-7	1.11	1.07	1.11	1.07	9-3 to 9-5	1.00	1.01	1.01	1.02
3-8	1.10	1.06	1.11	1.07	9-6 to 9-8	1.00	1.01	1.02	1.02
3-9	1.10	1.06	1.10	1.07	9-9 to 9-11	1.01	1.02	1.02	1.03
3-10	1.10	1.06	1.09	1.06	10-0 to 10-2	1.01	1.02	1.02	1.03
3-11	1.09	1.06	1.08	1.06	10-3 to 10-5	1.02	1.03	1.02	1.03
4-0	1.09	1.05	1.08	1.05	10-6 to 10-8	1.02	1.03	1.02	1.03
4-1	1.08	1.05	1.08	1.05	10-9 to 10-11	1.02	1.04	1.02	1.03
4-2	1.07	1.04	1.07	1.05	11-0 to 11-2	1.03	1.05	1.02	1.03
4-3	1.07	1.04	1.07	1.05	11-3 to 11-5	1.03	1.05	1.02	1.03
4-4	1.06	1.03	1.06	1.04	11-6 to 11-8	1.03	1.05	1.02	1.03
4-5	1.06	1.03	1.06	1.03	11-9 to 11-11	1.03	1.06	1.02	1.04
4-6	1.05	1.02	1.05	1.03	12-0 to 12-2	1.04	1.06	1.03	1.04
4-7	1.05	1.02	1.05	1.02	12-3 to 12-5	1.04	1.07	1.03	1.04
4-8	1.04	1.01	1.05	1.02	12-6 to 12-8	1.05	1.07	1.03	1.04
4-9	1.04	1.01	1.05	1.02	12-9 to 12-11	1.05	1.08	1.03	1.04
4-10	1.04	1.01	1.04	1.02	13-0 to 13-2	1.06	1.08	1.03	1.05
4-11	1.04	1.01	1.04	1.02	13-3 to 13-5	1.06	1.08	1.03	1.05
5-0	1.04	1.01	1.04	1.02	13-6 to 13-8	1.07	1.09	1.03	1.05
5-1	1.04	1.01	1.04	1.02	13-9 to 13-11	1.07	1.10	1.03	1.05
5-2	1.04	1.01	1.03	1.02	14-0 and up	1.08	1.12	1.04	1.06

1/ These factors were based on 50,522 records of cows that calved from November through June and on 28,520 records of those that calved from July through October.

TABLE 12.-HOLSTEIN AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, and New York 1

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.44	1.42	1.38	1.36	5-3	1.03	1.02	1.03	1.01
1-10	1.40	1.38	1.35	1.32	5-4	1.02	1.01	1.03	1.01
1-11	1.38	1.36	1.33	1.30	5-5	1.02	1.01	1.03	1.01
2-0	1.36	1.34	1.31	1.29	5-6	1.02	1.01	1.03	1.01
2-1	1.35	1.33	1.31	1.29	5-7	1.02	1.01	1.03	1.01
2-2	1.34	1.32	1.31	1.29	5-8	1.02	1.01	1.03	1.01
2-3	1.34	1.31	1.31	1.29	5-9	1.02	1.01	1.02	1.01
2-4	1.33	1.31	1.31	1.28	5-10	1.01	1.01	1.02	1.01
2-5	1.33	1.31	1.30	1.28	5-11	1.01	1.00	1.01	1.00
2-6	1.33	1.30	1.29	1.26	6-0 to 6-2	1.01	1.00	1.01	1.00
2-7	1.32	1.30	1.27	1.24	6-3 to 6-5	1.00	1.00	1.00	1.00
2-8	1.32	1.29	1.25	1.23	6-6 to 6-8	1.00	1.00	1.00	1.00
2-9	1.31	1.28	1.24	1.21	6-9 to 6-11	1.00	1.00	1.00	1.00
2-10	1.29	1.27	1.23	1.20	7-0 to 7-2	1.00	1.00	1.00	1.00
2-11	1.26	1.24	1.22	1.19	7-3 to 7-5	1.00	1.00	1.00	1.00
3-0	1.23	1.21	1.20	1.18	7-6 to 7-8	1.00	1.00	1.00	1.00
3-1	1.20	1.19	1.19	1.16	7-9 to 7-11	1.00	1.00	1.00	1.00
3-2	1.19	1.17	1.18	1.15	8-0 to 8-2	1.00	1.00	1.00	1.00
3-3	1.18	1.16	1.17	1.15	8-3 to 8-5	1.00	1.01	1.00	1.01
3-4	1.17	1.15	1.17	1.15	8-6 to 8-8	1.01	1.02	1.00	1.01
3-5	1.16	1.15	1.17	1.14	8-9 to 8-11	1.01	1.02	1.00	1.01
3-6	1.16	1.15	1.16	1.13	9-0 to 9-2	1.01	1.02	1.00	1.02
3-7	1.16	1.15	1.14	1.13	9-3 to 9-5	1.01	1.02	1.01	1.03
3-8	1.16	1.15	1.13	1.12	9-6 to 9-8	1.02	1.03	1.02	1.04
3-9	1.16	1.14	1.12	1.10	9-9 to 9-11	1.02	1.03	1.02	1.04
3-10	1.15	1.13	1.11	1.09	10-0 to 10-2	1.02	1.04	1.03	1.05
3-11	1.13	1.11	1.10	1.08	10-3 to 10-5	1.03	1.05	1.03	1.05
4-0	1.11	1.10	1.08	1.07	10-6 to 10-8	1.03	1.05	1.04	1.06
4-1	1.09	1.08	1.08	1.06	10-9 to 10-11	1.03	1.05	1.04	1.06
4-2	1.08	1.07	1.07	1.05	11-0 to 11-2	1.03	1.05	1.05	1.07
4-3	1.07	1.06	1.07	1.05	11-3 to 11-5	1.04	1.06	1.05	1.07
4-4	1.07	1.06	1.07	1.05	11-6 to 11-8	1.04	1.06	1.05	1.07
4-5	1.06	1.05	1.07	1.05	11-9 to 11-11	1.04	1.07	1.06	1.07
4-6	1.06	1.05	1.07	1.05	12-0 to 12-2	1.05	1.07	1.06	1.08
4-7	1.06	1.05	1.06	1.04	12-3 to 12-5	1.05	1.08	1.07	1.08
4-8	1.06	1.05	1.05	1.03	12-6 to 12-8	1.06	1.08	1.07	1.08
4-9	1.06	1.05	1.04	1.03	12-9 to 12-11	1.06	1.09	1.08	1.09
4-10	1.06	1.05	1.03	1.02	13-0 to 13-2	1.07	1.10	1.08	1.09
4-11	1.05	1.04	1.03	1.02	13-3 to 13-5	1.08	1.10	1.08	1.10
5-0	1.04	1.03	1.03	1.01	13-6 to 13-8	1.09	1.11	1.08	1.11
5-1	1.04	1.03	1.03	1.01	13-9 to 13-11	1.10	1.12	1.08	1.12
5-2	1.03	1.02	1.03	1.01	14-0 and up	1.12	1.14	1.09	1.13

1/ These factors were based on 91,883 records of cows that calved from November through June and on 68,869 records of those that calved from July through October.

TABLE 13.-HOLSTEIN AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in New Jersey and Pennsylvania 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.44	1.40	1.39	1.36	5-3	1.03	1.01	1.03	1.02
1-10	1.40	1.36	1.34	1.31	5-4	1.02	1.01	1.03	1.02
1-11	1.37	1.33	1.31	1.28	5-5	1.02	1.01	1.03	1.02
2-0	1.35	1.31	1.29	1.27	5-6	1.02	1.01	1.03	1.02
2-1	1.33	1.29	1.29	1.26	5-7	1.02	1.01	1.03	1.01
2-2	1.32	1.28	1.28	1.25	5-8	1.02	1.01	1.02	1.01
2-3	1.31	1.27	1.28	1.25	5-9	1.02	1.01	1.01	1.00
2-4	1.30	1.26	1.28	1.25	5-10	1.02	1.01	1.01	1.00
2-5	1.29	1.26	1.27	1.25	5-11	1.01	1.00	1.01	1.00
2-6	1.29	1.26	1.26	1.24	6-0 to 6-2	1.01	1.00	1.00	1.00
2-7	1.29	1.26	1.25	1.22	6-3 to 6-5	1.01	1.00	1.00	1.00
2-8	1.28	1.25	1.23	1.21	6-6 to 6-8	1.00	1.00	1.00	1.00
2-9	1.26	1.23	1.22	1.19	6-9 to 6-11	1.00	1.00	1.00	1.00
2-10	1.25	1.22	1.20	1.18	7-0 to 7-2	1.00	1.00	1.00	1.00
2-11	1.23	1.20	1.19	1.16	7-3 to 7-5	1.00	1.00	1.00	1.00
3-0	1.21	1.18	1.17	1.15	7-6 to 7-8	1.00	1.00	1.00	1.00
3-1	1.19	1.16	1.17	1.14	7-9 to 7-11	1.00	1.00	1.00	1.00
3-2	1.18	1.15	1.17	1.14	8-0 to 8-2	1.00	1.01	1.00	1.00
3-3	1.16	1.14	1.17	1.14	8-3 to 8-5	1.00	1.01	1.01	1.01
3-4	1.15	1.13	1.17	1.14	8-6 to 8-8	1.00	1.01	1.01	1.01
3-5	1.15	1.13	1.16	1.14	8-9 to 8-11	1.01	1.02	1.01	1.02
3-6	1.15	1.13	1.15	1.13	9-0 to 9-2	1.02	1.02	1.01	1.02
3-7	1.15	1.13	1.14	1.12	9-3 to 9-5	1.02	1.02	1.02	1.03
3-8	1.14	1.13	1.13	1.11	9-6 to 9-8	1.02	1.03	1.02	1.04
3-9	1.13	1.12	1.12	1.10	9-9 to 9-11	1.03	1.04	1.02	1.04
3-10	1.12	1.11	1.10	1.08	10-0 to 10-2	1.03	1.04	1.02	1.04
3-11	1.11	1.09	1.09	1.07	10-3 to 10-5	1.03	1.04	1.02	1.04
4-0	1.10	1.08	1.08	1.06	10-6 to 10-8	1.03	1.05	1.03	1.05
4-1	1.09	1.07	1.07	1.05	10-9 to 10-11	1.04	1.05	1.03	1.05
4-2	1.08	1.06	1.07	1.05	11-0 to 11-2	1.04	1.06	1.04	1.06
4-3	1.07	1.05	1.07	1.05	11-3 to 11-5	1.04	1.06	1.04	1.06
4-4	1.06	1.04	1.07	1.05	11-6 to 11-8	1.05	1.06	1.04	1.06
4-5	1.06	1.04	1.07	1.05	11-9 to 11-11	1.05	1.07	1.05	1.06
4-6	1.06	1.04	1.06	1.05	12-0 to 12-2	1.05	1.07	1.05	1.07
4-7	1.06	1.04	1.05	1.04	12-3 to 12-5	1.06	1.08	1.06	1.07
4-8	1.06	1.04	1.05	1.03	12-6 to 12-8	1.06	1.09	1.06	1.07
4-9	1.06	1.04	1.04	1.02	12-9 to 12-11	1.07	1.10	1.06	1.08
4-10	1.05	1.04	1.03	1.02	13-0 to 13-2	1.08	1.10	1.07	1.08
4-11	1.05	1.04	1.03	1.02	13-3 to 13-5	1.09	1.11	1.07	1.09
5-0	1.04	1.03	1.03	1.02	13-6 to 13-8	1.10	1.12	1.08	1.10
5-1	1.03	1.02	1.03	1.02	13-9 to 13-11	1.11	1.14	1.09	1.11
5-2	1.03	1.02	1.03	1.02	14-0 and up	1.12	1.16	1.10	1.13

1/ These factors were based on 78,968 records of cows that calved from November through June and on 49,064 records of those that calved from July through October.

TABLE 14.--HOLSTEIN AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Indiana, Illinois, Ohio, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.40	1.38	1.32	1.30	5-3	1.02	1.01	1.02	1.01
1-10	1.35	1.33	1.28	1.26	5-4	1.02	1.01	1.02	1.01
1-11	1.32	1.30	1.26	1.24	5-5	1.02	1.01	1.02	1.01
2-0	1.30	1.28	1.25	1.23	5-6	1.02	1.01	1.02	1.01
2-1	1.29	1.27	1.24	1.22	5-7	1.02	1.01	1.02	1.01
2-2	1.28	1.25	1.23	1.21	5-8	1.02	1.01	1.01	1.00
2-3	1.26	1.24	1.23	1.21	5-9	1.02	1.01	1.01	1.00
2-4	1.25	1.23	1.22	1.20	5-10	1.01	1.01	1.00	1.00
2-5	1.25	1.22	1.22	1.20	5-11	1.01	1.00	1.00	1.00
2-6	1.24	1.22	1.21	1.19	6-0 to 6-2	1.01	1.00	1.00	1.00
2-7	1.24	1.22	1.21	1.18	6-3 to 6-5	1.00	1.00	1.00	1.00
2-8	1.24	1.22	1.20	1.17	6-6 to 6-8	1.00	1.00	1.00	1.00
2-9	1.24	1.21	1.19	1.16	6-9 to 6-11	1.00	1.00	1.00	1.00
2-10	1.23	1.21	1.18	1.15	7-0 to 7-2	1.00	1.00	1.00	1.00
2-11	1.21	1.19	1.17	1.14	7-3 to 7-5	1.00	1.00	1.00	1.00
3-0	1.19	1.17	1.16	1.13	7-6 to 7-8	1.00	1.00	1.00	1.00
3-1	1.18	1.16	1.15	1.13	7-9 to 7-11	1.00	1.00	1.00	1.00
3-2	1.16	1.15	1.14	1.12	8-0 to 8-2	1.00	1.00	1.00	1.01
3-3	1.15	1.14	1.14	1.12	8-3 to 8-5	1.00	1.01	1.00	1.01
3-4	1.14	1.13	1.14	1.12	8-6 to 8-8	1.01	1.01	1.01	1.01
3-5	1.13	1.12	1.14	1.12	8-9 to 8-11	1.01	1.02	1.01	1.02
3-6	1.13	1.11	1.13	1.11	9-0 to 9-2	1.01	1.02	1.01	1.02
3-7	1.12	1.11	1.12	1.10	9-3 to 9-5	1.01	1.02	1.01	1.03
3-8	1.12	1.11	1.11	1.09	9-6 to 9-8	1.02	1.03	1.02	1.03
3-9	1.12	1.10	1.10	1.08	9-9 to 9-11	1.02	1.04	1.02	1.04
3-10	1.11	1.10	1.09	1.07	10-0 to 10-2	1.03	1.04	1.02	1.04
3-11	1.10	1.09	1.08	1.06	10-3 to 10-5	1.03	1.04	1.03	1.05
4-0	1.09	1.08	1.07	1.05	10-6 to 10-8	1.03	1.05	1.03	1.05
4-1	1.08	1.07	1.06	1.04	10-9 to 10-11	1.03	1.05	1.03	1.05
4-2	1.07	1.06	1.06	1.04	11-0 to 11-2	1.04	1.06	1.03	1.05
4-3	1.06	1.05	1.06	1.04	11-3 to 11-5	1.04	1.06	1.04	1.06
4-4	1.05	1.04	1.06	1.04	11-6 to 11-8	1.04	1.06	1.04	1.06
4-5	1.05	1.04	1.06	1.04	11-9 to 11-11	1.05	1.07	1.04	1.07
4-6	1.05	1.03	1.05	1.03	12-0 to 12-2	1.05	1.07	1.05	1.07
4-7	1.05	1.03	1.04	1.03	12-3 to 12-5	1.06	1.08	1.05	1.08
4-8	1.04	1.03	1.03	1.02	12-6 to 12-8	1.06	1.08	1.06	1.08
4-9	1.04	1.03	1.03	1.02	12-9 to 12-11	1.07	1.09	1.06	1.09
4-10	1.04	1.03	1.02	1.01	13-0 to 13-2	1.08	1.10	1.07	1.09
4-11	1.04	1.03	1.02	1.01	13-3 to 13-5	1.08	1.11	1.08	1.10
5-0	1.04	1.03	1.02	1.01	13-6 to 13-8	1.09	1.12	1.09	1.11
5-1	1.03	1.02	1.02	1.01	13-9 to 13-11	1.10	1.13	1.10	1.13
5-2	1.03	1.02	1.02	1.01	14-0 and up	1.12	1.15	1.12	1.16

1/ These factors were based on 222,032 records of cows that calved from November through June and on 153,263 records of those that calved from July through October.

ABLE 15.--HOLSTEIN AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Delaware, Maryland, Virginia, Kentucky, Tennessee, North Carolina, West Virginia, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Arkansas 1/

ge in ears and onths	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
-9	1.50	1.46	1.36	1.34	5-3	1.04	1.03	1.02	1.01
-10	1.44	1.40	1.33	1.30	5-4	1.03	1.02	1.02	1.01
-11	1.38	1.34	1.30	1.27	5-5	1.02	1.01	1.02	1.01
-0	1.33	1.30	1.28	1.25	5-6	1.02	1.01	1.02	1.01
-1	1.30	1.27	1.27	1.24	5-7	1.02	1.01	1.02	1.01
-2	1.29	1.26	1.25	1.23	5-8	1.02	1.01	1.02	1.01
-3	1.28	1.25	1.24	1.22	5-9	1.02	1.01	1.02	1.01
-4	1.27	1.24	1.24	1.21	5-10	1.02	1.01	1.01	1.00
-5	1.26	1.23	1.23	1.20	5-11	1.01	1.00	1.00	1.00
-6	1.25	1.22	1.23	1.20	6-0 to 6-2	1.01	1.00	1.00	1.00
-7	1.25	1.22	1.22	1.19	6-3 to 6-5	1.00	1.00	1.00	1.00
-8	1.24	1.21	1.21	1.18	6-6 to 6-8	1.00	1.00	1.00	1.00
-9	1.24	1.21	1.19	1.17	6-9 to 6-11	1.00	1.00	1.00	1.00
-10	1.24	1.21	1.18	1.16	7-0 to 7-2	1.00	1.00	1.00	1.00
-11	1.23	1.20	1.17	1.15	7-3 to 7-5	1.00	1.00	1.00	1.00
-0	1.21	1.19	1.17	1.14	7-6 to 7-8	1.00	1.00	1.00	1.01
-1	1.19	1.17	1.16	1.13	7-9 to 7-11	1.00	1.00	1.00	1.01
-2	1.17	1.15	1.15	1.13	8-0 to 8-2	1.00	1.00	1.00	1.01
-3	1.16	1.14	1.15	1.12	8-3 to 8-5	1.00	1.00	1.01	1.02
-4	1.15	1.13	1.15	1.12	8-6 to 8-8	1.00	1.00	1.01	1.02
-5	1.14	1.12	1.15	1.12	8-9 to 8-11	1.00	1.01	1.02	1.03
-6	1.13	1.11	1.14	1.11	9-0 to 9-2	1.01	1.01	1.02	1.03
-7	1.12	1.11	1.13	1.10	9-3 to 9-5	1.01	1.01	1.03	1.04
-8	1.12	1.11	1.12	1.09	9-6 to 9-8	1.01	1.02	1.03	1.04
-9	1.12	1.11	1.10	1.08	9-9 to 9-11	1.02	1.03	1.03	1.04
-10	1.12	1.11	1.09	1.07	10-0 to 10-2	1.02	1.03	1.03	1.04
-11	1.12	1.11	1.08	1.06	10-3 to 10-5	1.02	1.03	1.03	1.04
-0	1.11	1.10	1.07	1.05	10-6 to 10-8	1.02	1.03	1.03	1.04
-1	1.10	1.08	1.07	1.05	10-9 to 10-11	1.02	1.03	1.03	1.05
-2	1.09	1.07	1.07	1.05	11-0 to 11-2	1.02	1.04	1.03	1.05
-3	1.08	1.06	1.07	1.05	11-3 to 11-5	1.03	1.04	1.03	1.05
-4	1.07	1.05	1.06	1.05	11-6 to 11-8	1.03	1.04	1.04	1.06
-5	1.06	1.05	1.06	1.04	11-9 to 11-11	1.03	1.05	1.04	1.06
-6	1.05	1.04	1.06	1.04	12-0 to 12-2	1.04	1.05	1.04	1.07
-7	1.05	1.04	1.05	1.04	12-3 to 12-5	1.04	1.06	1.05	1.07
-8	1.05	1.04	1.05	1.03	12-6 to 12-8	1.05	1.06	1.05	1.08
-9	1.05	1.04	1.04	1.02	12-9 to 12-11	1.06	1.07	1.06	1.09
-10	1.05	1.04	1.03	1.01	13-0 to 13-2	1.06	1.08	1.06	1.10
-11	1.05	1.04	1.02	1.01	13-3 to 13-5	1.07	1.09	1.07	1.11
-0	1.05	1.03	1.02	1.01	13-6 to 13-8	1.08	1.10	1.08	1.12
-1	1.05	1.03	1.02	1.01	13-9 to 13-11	1.09	1.11	1.10	1.13
-2	1.04	1.03	1.02	1.01	14-0 and up	1.11	1.14	1.12	1.16

/ These factors were based on 42,638 records of cows that calved from November through June d on 37,342 records of those that calved from July through October.

TABLE 16.--HOLSTEIN AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Idaho, Wyoming, Montana, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, Alaska, and Hawaii 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fa
1-9	1.43	1.40	1.38	1.35	5-3	1.03	1.02	1.03	1.0
1-10	1.38	1.35	1.34	1.31	5-4	1.03	1.02	1.03	1.0
1-11	1.34	1.31	1.31	1.28	5-5	1.02	1.02	1.03	1.0
2-0	1.31	1.28	1.28	1.26	5-6	1.02	1.01	1.03	1.0
2-1	1.29	1.26	1.27	1.24	5-7	1.02	1.01	1.02	1.0
2-2	1.28	1.25	1.25	1.23	5-8	1.02	1.01	1.02	1.0
2-3	1.26	1.23	1.24	1.22	5-9	1.02	1.01	1.01	1.0
2-4	1.25	1.22	1.23	1.21	5-10	1.02	1.01	1.01	1.0
2-5	1.24	1.21	1.22	1.20	5-11	1.02	1.01	1.01	1.0
2-6	1.24	1.21	1.21	1.19	6-0 to 6-2	1.01	1.01	1.01	1.0
2-7	1.24	1.21	1.20	1.17	6-3 to 6-5	1.00	1.00	1.01	1.0
2-8	1.23	1.20	1.19	1.16	6-6 to 6-8	1.00	1.00	1.00	1.0
2-9	1.23	1.20	1.18	1.15	6-9 to 6-11	1.00	1.00	1.00	1.0
2-10	1.22	1.19	1.18	1.15	7-0 to 7-2	1.00	1.00	1.00	1.0
2-11	1.21	1.18	1.17	1.15	7-3 to 7-5	1.00	1.00	1.00	1.0
3-0	1.20	1.17	1.17	1.14	7-6 to 7-8	1.00	1.00	1.00	1.0
3-1	1.18	1.16	1.16	1.13	7-9 to 7-11	1.00	1.00	1.00	1.0
3-2	1.17	1.14	1.15	1.12	8-0 to 8-2	1.00	1.00	1.00	1.0
3-3	1.16	1.13	1.14	1.11	8-3 to 8-5	1.00	1.01	1.00	1.0
3-4	1.14	1.12	1.13	1.11	8-6 to 8-8	1.00	1.01	1.00	1.0
3-5	1.14	1.11	1.13	1.10	8-9 to 8-11	1.01	1.02	1.00	1.0
3-6	1.13	1.11	1.12	1.10	9-0 to 9-2	1.01	1.02	1.01	1.0
3-7	1.13	1.11	1.12	1.09	9-3 to 9-5	1.01	1.02	1.01	1.0
3-8	1.13	1.11	1.11	1.09	9-6 to 9-8	1.02	1.03	1.01	1.0
3-9	1.13	1.11	1.10	1.08	9-9 to 9-11	1.02	1.04	1.02	1.0
3-10	1.12	1.10	1.10	1.08	10-0 to 10-2	1.03	1.04	1.02	1.0
3-11	1.12	1.09	1.09	1.07	10-3 to 10-5	1.03	1.05	1.02	1.0
4-0	1.11	1.08	1.08	1.06	10-6 to 10-8	1.04	1.05	1.03	1.0
4-1	1.09	1.07	1.07	1.05	10-9 to 10-11	1.04	1.05	1.03	1.0
4-2	1.08	1.06	1.06	1.04	11-0 to 11-2	1.05	1.06	1.04	1.0
4-3	1.07	1.05	1.06	1.04	11-3 to 11-5	1.05	1.06	1.04	1.0
4-4	1.06	1.05	1.05	1.03	11-6 to 11-8	1.05	1.07	1.05	1.0
4-5	1.06	1.04	1.05	1.03	11-9 to 11-11	1.06	1.07	1.05	1.0
4-6	1.06	1.04	1.05	1.03	12-0 to 12-2	1.06	1.08	1.06	1.0
4-7	1.06	1.04	1.04	1.02	12-3 to 12-5	1.06	1.08	1.06	1.0
4-8	1.06	1.04	1.04	1.02	12-6 to 12-8	1.07	1.09	1.07	1.0
4-9	1.06	1.04	1.03	1.02	12-9 to 12-11	1.07	1.09	1.08	1.0
4-10	1.06	1.04	1.03	1.01	13-0 to 13-2	1.08	1.10	1.08	1.0
4-11	1.06	1.04	1.03	1.01	13-3 to 13-5	1.09	1.10	1.09	1.1
5-0	1.06	1.04	1.03	1.01	13-6 to 13-8	1.10	1.11	1.10	1.1
5-1	1.05	1.04	1.03	1.01	13-9 to 13-11	1.11	1.12	1.11	1.1
5-2	1.04	1.03	1.03	1.01	14-0 and up	1.13	1.15	1.12	1.1

1/ These factors were based on 82,084 records of cows that calved from November through June and on 51,688 records of those that calved from July through October.

TABLE 17.--HOLSTEIN AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in California 1/

Age in years and months	Adjustment factors by season of calving			
	November to June		July to October	
	Milk	Fat	Milk	Fat
1-9	1.45	1.42	1.41	1.39
1-10	1.42	1.40	1.38	1.36
1-11	1.39	1.37	1.36	1.34
2-0	1.38	1.35	1.35	1.32
2-1	1.37	1.34	1.33	1.31
2-2	1.35	1.32	1.31	1.29
2-3	1.33	1.30	1.30	1.28
2-4	1.32	1.28	1.29	1.27
2-5	1.30	1.27	1.28	1.26
2-6	1.29	1.26	1.27	1.24
2-7	1.28	1.25	1.25	1.23
2-8	1.27	1.24	1.23	1.21
2-9	1.26	1.24	1.22	1.20
2-10	1.25	1.23	1.21	1.19
2-11	1.24	1.22	1.20	1.18
-0	1.23	1.21	1.19	1.17
-1	1.21	1.19	1.19	1.17
-2	1.20	1.18	1.19	1.17
-3	1.20	1.17	1.19	1.17
-4	1.19	1.17	1.19	1.17
-5	1.18	1.16	1.18	1.16
-6	1.17	1.15	1.17	1.15
-7	1.15	1.14	1.16	1.14
-8	1.14	1.13	1.14	1.13
-9	1.13	1.12	1.12	1.11
-10	1.12	1.11	1.10	1.09
-11	1.11	1.10	1.09	1.08
-0	1.11	1.09	1.08	1.07
-1	1.09	1.08	1.08	1.07
-2	1.08	1.07	1.08	1.07
-3	1.08	1.06	1.08	1.07
-4	1.08	1.06	1.08	1.07
-5	1.08	1.06	1.08	1.07
-6	1.08	1.06	1.08	1.07
-7	1.07	1.06	1.07	1.06
-8	1.07	1.06	1.06	1.05
-9	1.06	1.05	1.05	1.04
-10	1.06	1.05	1.04	1.03
-11	1.06	1.05	1.03	1.02
-0	1.06	1.05	1.03	1.02
-1	1.06	1.04	1.03	1.02
-2	1.05	1.03	1.03	1.02
5-3	1.04	1.03	1.03	1.02
5-4	1.03	1.03	1.03	1.02
5-5	1.03	1.03	1.03	1.02
5-6	1.03	1.03	1.03	1.02
5-7	1.03	1.03	1.03	1.02
5-8	1.03	1.03	1.03	1.01
5-9	1.03	1.03	1.02	1.01
5-10	1.03	1.02	1.02	1.01
5-11	1.02	1.01	1.02	1.01
6-0 to 6-2	1.01	1.01	1.02	1.01
6-3 to 6-5	1.01	1.00	1.02	1.01
6-6 to 6-8	1.00	1.00	1.01	1.01
6-9 to 6-11	1.00	1.00	1.00	1.00
7-0 to 7-2	1.00	1.00	1.00	1.00
7-3 to 7-5	1.00	1.00	1.00	1.00
7-6 to 7-8	1.00	1.00	1.00	1.00
7-9 to 7-11	1.00	1.00	1.00	1.00
8-0 to 8-2	1.00	1.00	1.00	1.00
8-3 to 8-5	1.00	1.00	1.00	1.00
8-6 to 8-8	1.00	1.01	1.01	1.01
8-9 to 8-11	1.01	1.01	1.02	1.01
9-0 to 9-2	1.01	1.02	1.02	1.02
9-3 to 9-5	1.02	1.02	1.03	1.02
9-6 to 9-8	1.03	1.03	1.03	1.03
9-9 to 9-11	1.03	1.03	1.03	1.03
10-0 to 10-2	1.04	1.04	1.03	1.04
10-3 to 10-5	1.05	1.05	1.04	1.04
10-6 to 10-8	1.05	1.05	1.04	1.05
10-9 to 10-11	1.06	1.06	1.04	1.05
11-0 to 11-2	1.07	1.07	1.05	1.06
11-3 to 11-5	1.07	1.07	1.06	1.07
11-6 to 11-8	1.08	1.08	1.07	1.08
11-9 to 11-11	1.08	1.08	1.08	1.08
12-0 to 12-2	1.09	1.09	1.09	1.09
12-3 to 12-5	1.09	1.10	1.10	1.10
12-6 to 12-8	1.10	1.10	1.11	1.11
12-9 to 12-11	1.11	1.11	1.12	1.12
13-0 to 13-2	1.11	1.11	1.13	1.13
13-3 to 13-5	1.11	1.12	1.14	1.14
13-6 to 13-8	1.12	1.13	1.15	1.16
13-9 to 13-11	1.12	1.13	1.16	1.17
14-0 and up	1.12	1.13	1.17	1.18

/ These factors were based on 16,429 records of cows that calved from November through June nd on 9,146 records of those that calved from July through October.

TABLE 18.--JERSEY AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.38	1.35	1.32	1.30	5-3	1.03	1.01	1.01	1.00
1-10	1.33	1.29	1.28	1.25	5-4	1.02	1.00	1.01	1.00
1-11	1.30	1.27	1.26	1.23	5-5	1.01	1.00	1.01	1.00
2-0	1.30	1.26	1.24	1.21	5-6	1.01	1.00	1.01	1.00
2-1	1.29	1.26	1.23	1.20	5-7	1.01	1.00	1.01	1.00
2-2	1.29	1.26	1.22	1.19	5-8	1.01	1.00	1.01	1.00
2-3	1.29	1.26	1.22	1.19	5-9	1.01	1.00	1.00	1.00
2-4	1.29	1.26	1.22	1.19	5-10	1.01	1.00	1.00	1.00
2-5	1.28	1.25	1.22	1.19	5-11	1.01	1.00	1.00	1.00
2-6	1.28	1.25	1.22	1.19	6-0 to 6-2	1.01	1.00	1.00	1.00
2-7	1.27	1.24	1.21	1.19	6-3 to 6-5	1.00	1.00	1.00	1.00
2-8	1.26	1.23	1.20	1.18	6-6 to 6-8	1.00	1.00	1.00	1.00
2-9	1.24	1.21	1.19	1.16	6-9 to 6-11	1.00	1.00	1.00	1.00
2-10	1.22	1.18	1.17	1.14	7-0 to 7-2	1.00	1.00	1.00	1.00
2-11	1.19	1.15	1.15	1.12	7-3 to 7-5	1.00	1.00	1.00	1.00
3-0	1.17	1.13	1.13	1.10	7-6 to 7-8	1.00	1.01	1.00	1.00
3-1	1.16	1.12	1.12	1.09	7-9 to 7-11	1.00	1.01	1.00	1.00
3-2	1.15	1.11	1.12	1.09	8-0 to 8-2	1.01	1.01	1.00	1.01
3-3	1.14	1.11	1.12	1.09	8-3 to 8-5	1.01	1.01	1.00	1.01
3-4	1.13	1.10	1.12	1.09	8-6 to 8-8	1.01	1.02	1.00	1.01
3-5	1.13	1.10	1.12	1.09	8-9 to 8-11	1.01	1.03	1.01	1.02
3-6	1.13	1.09	1.12	1.09	9-0 to 9-2	1.02	1.03	1.01	1.02
3-7	1.12	1.09	1.11	1.08	9-3 to 9-5	1.02	1.03	1.01	1.02
3-8	1.12	1.09	1.10	1.07	9-6 to 9-8	1.02	1.03	1.02	1.03
3-9	1.11	1.08	1.09	1.06	9-9 to 9-11	1.02	1.03	1.02	1.03
3-10	1.10	1.07	1.08	1.05	10-0 to 10-2	1.02	1.03	1.03	1.04
3-11	1.09	1.06	1.06	1.04	10-3 to 10-5	1.02	1.04	1.03	1.04
4-0	1.07	1.05	1.05	1.03	10-6 to 10-8	1.02	1.04	1.04	1.05
4-1	1.06	1.04	1.04	1.02	10-9 to 10-11	1.02	1.04	1.04	1.05
4-2	1.05	1.03	1.04	1.01	11-0 to 11-2	1.02	1.04	1.04	1.06
4-3	1.05	1.03	1.04	1.01	11-3 to 11-5	1.02	1.04	1.04	1.06
4-4	1.04	1.02	1.04	1.01	11-6 to 11-8	1.02	1.04	1.04	1.06
4-5	1.04	1.02	1.04	1.01	11-9 to 11-11	1.02	1.05	1.04	1.06
4-6	1.04	1.02	1.04	1.01	12-0 to 12-2	1.03	1.05	1.04	1.06
4-7	1.04	1.02	1.03	1.01	12-3 to 12-5	1.03	1.06	1.04	1.06
4-8	1.04	1.02	1.03	1.00	12-6 to 12-8	1.03	1.06	1.04	1.06
4-9	1.04	1.02	1.03	1.00	12-9 to 12-11	1.03	1.07	1.04	1.06
4-10	1.04	1.02	1.03	1.00	13-0 to 13-2	1.03	1.07	1.05	1.06
4-11	1.04	1.02	1.02	1.00	13-3 to 13-5	1.03	1.07	1.05	1.06
5-0	1.04	1.02	1.01	1.00	13-6 to 13-8	1.03	1.08	1.05	1.07
5-1	1.04	1.02	1.01	1.00	13-9 to 13-11	1.03	1.08	1.05	1.07
5-2	1.04	1.01	1.01	1.00	14-0 and up	1.04	1.09	1.06	1.07

1/ These factors were based on 21,958 records of cows that calved from November through June and on 13,664 records of those that calved from July through October.

TABLE 19.--JERSEY AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Indiana, Illinois, Ohio, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.34	1.31	1.26	1.24	5-3	1.02	1.00	1.02	1.01
1-10	1.32	1.29	1.24	1.22	5-4	1.02	1.00	1.02	1.01
1-11	1.29	1.27	1.23	1.21	5-5	1.02	1.00	1.02	1.01
2-0	1.28	1.25	1.22	1.20	5-6	1.02	1.00	1.02	1.01
2-1	1.27	1.24	1.21	1.19	5-7	1.02	1.00	1.02	1.01
2-2	1.26	1.23	1.21	1.18	5-8	1.02	1.00	1.02	1.01
2-3	1.26	1.23	1.21	1.18	5-9	1.02	1.00	1.02	1.01
2-4	1.26	1.23	1.21	1.18	5-10	1.01	1.00	1.02	1.01
2-5	1.26	1.23	1.20	1.17	5-11	1.01	1.00	1.01	1.00
2-6	1.25	1.23	1.19	1.16	6-0 to 6-2	1.00	1.00	1.01	1.00
2-7	1.25	1.22	1.18	1.15	6-3 to 6-5	1.00	1.00	1.01	1.00
2-8	1.23	1.20	1.16	1.14	6-6 to 6-8	1.00	1.00	1.01	1.00
2-9	1.21	1.17	1.14	1.12	6-9 to 6-11	1.00	1.00	1.00	1.00
2-10	1.18	1.15	1.13	1.10	7-0 to 7-2	1.00	1.00	1.00	1.00
2-11	1.16	1.13	1.13	1.09	7-3 to 7-5	1.00	1.01	1.00	1.00
3-0	1.15	1.12	1.13	1.09	7-6 to 7-8	1.00	1.01	1.00	1.00
3-1	1.14	1.11	1.12	1.09	7-9 to 7-11	1.00	1.01	1.00	1.00
3-2	1.14	1.10	1.11	1.08	8-0 to 8-2	1.00	1.01	1.00	1.01
3-3	1.14	1.10	1.11	1.08	8-3 to 8-5	1.00	1.01	1.01	1.02
3-4	1.13	1.10	1.11	1.08	8-6 to 8-8	1.00	1.01	1.01	1.02
3-5	1.13	1.10	1.11	1.08	8-9 to 8-11	1.01	1.02	1.01	1.02
3-6	1.13	1.10	1.11	1.08	9-0 to 9-2	1.01	1.02	1.01	1.02
3-7	1.13	1.10	1.11	1.08	9-3 to 9-5	1.01	1.03	1.01	1.02
3-8	1.13	1.10	1.11	1.08	9-6 to 9-8	1.01	1.03	1.01	1.03
3-9	1.12	1.09	1.10	1.07	9-9 to 9-11	1.01	1.03	1.01	1.03
3-10	1.11	1.08	1.08	1.05	10-0 to 10-2	1.01	1.03	1.01	1.03
3-11	1.09	1.06	1.06	1.03	10-3 to 10-5	1.02	1.03	1.02	1.03
4-0	1.07	1.04	1.05	1.02	10-6 to 10-8	1.02	1.03	1.02	1.03
4-1	1.06	1.03	1.05	1.02	10-9 to 10-11	1.02	1.03	1.02	1.03
4-2	1.05	1.03	1.05	1.02	11-0 to 11-2	1.03	1.04	1.02	1.03
4-3	1.04	1.03	1.05	1.02	11-3 to 11-5	1.03	1.04	1.02	1.04
4-4	1.04	1.03	1.05	1.02	11-6 to 11-8	1.03	1.04	1.02	1.04
4-5	1.04	1.03	1.05	1.01	11-9 to 11-11	1.04	1.05	1.03	1.04
4-6	1.04	1.03	1.04	1.01	12-0 to 12-2	1.04	1.05	1.03	1.05
4-7	1.04	1.03	1.04	1.01	12-3 to 12-5	1.05	1.05	1.04	1.05
4-8	1.04	1.03	1.03	1.01	12-6 to 12-8	1.05	1.06	1.04	1.06
4-9	1.04	1.03	1.03	1.01	12-9 to 12-11	1.06	1.06	1.05	1.06
4-10	1.04	1.03	1.02	1.01	13-0 to 13-2	1.06	1.07	1.05	1.07
4-11	1.04	1.02	1.02	1.01	13-3 to 13-5	1.06	1.07	1.05	1.07
5-0	1.03	1.02	1.02	1.01	13-6 to 13-8	1.07	1.08	1.06	1.08
5-1	1.02	1.01	1.02	1.01	13-9 to 13-11	1.07	1.08	1.06	1.08
5-2	1.02	1.01	1.02	1.01	14-0 and up	1.08	1.09	1.07	1.09

1/ These factors were based on 22,601 records of cows that calved from November through June and on 13,438 records of those that calved from July through October.

TABLE 20.--JERSEY AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, and Texas 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.34	1.30	1.25	1.21	5-3	1.01	1.00	1.01	1.00
1-10	1.31	1.28	1.23	1.19	5-4	1.01	1.00	1.01	1.00
1-11	1.29	1.26	1.22	1.19	5-5	1.01	1.00	1.01	1.00
2-0	1.28	1.24	1.22	1.19	5-6	1.01	1.00	1.01	1.00
2-1	1.26	1.23	1.22	1.19	5-7	1.01	1.00	1.01	1.00
2-2	1.25	1.22	1.22	1.19	5-8	1.01	1.00	1.00	1.00
2-3	1.23	1.20	1.22	1.19	5-9	1.01	1.00	1.00	1.00
2-4	1.22	1.19	1.21	1.19	5-10	1.01	1.00	1.00	1.00
2-5	1.21	1.18	1.20	1.18	5-11	1.01	1.00	1.00	1.00
2-6	1.21	1.18	1.19	1.17	6-0 to 6-2	1.00	1.00	1.00	1.00
2-7	1.21	1.18	1.18	1.16	6-3 to 6-5	1.00	1.00	1.00	1.00
2-8	1.21	1.18	1.17	1.15	6-6 to 6-8	1.00	1.00	1.00	1.00
2-9	1.20	1.17	1.16	1.14	6-9 to 6-11	1.00	1.00	1.00	1.00
2-10	1.18	1.15	1.15	1.13	7-0 to 7-2	1.00	1.00	1.00	1.00
2-11	1.17	1.13	1.14	1.12	7-3 to 7-5	1.00	1.01	1.00	1.01
3-0	1.15	1.12	1.14	1.11	7-6 to 7-8	1.01	1.01	1.00	1.01
3-1	1.14	1.11	1.14	1.11	7-9 to 7-11	1.01	1.02	1.00	1.01
3-2	1.13	1.10	1.14	1.11	8-0 to 8-2	1.01	1.02	1.00	1.01
3-3	1.11	1.09	1.14	1.11	8-3 to 8-5	1.01	1.02	1.01	1.02
3-4	1.10	1.08	1.13	1.10	8-6 to 8-8	1.01	1.02	1.01	1.02
3-5	1.09	1.07	1.13	1.10	8-9 to 8-11	1.01	1.02	1.01	1.02
3-6	1.09	1.07	1.13	1.10	9-0 to 9-2	1.01	1.02	1.01	1.02
3-7	1.09	1.07	1.12	1.10	9-3 to 9-5	1.01	1.02	1.02	1.03
3-8	1.09	1.07	1.11	1.09	9-6 to 9-8	1.01	1.02	1.02	1.03
3-9	1.09	1.07	1.09	1.07	9-9 to 9-11	1.01	1.03	1.03	1.04
3-10	1.09	1.06	1.07	1.05	10-0 to 10-2	1.02	1.03	1.03	1.04
3-11	1.08	1.05	1.06	1.03	10-3 to 10-5	1.02	1.04	1.04	1.05
4-0	1.07	1.04	1.05	1.02	10-6 to 10-8	1.03	1.04	1.04	1.05
4-1	1.06	1.03	1.05	1.02	10-9 to 10-11	1.03	1.04	1.05	1.06
4-2	1.05	1.02	1.05	1.02	11-0 to 11-2	1.04	1.05	1.06	1.07
4-3	1.04	1.02	1.04	1.02	11-3 to 11-5	1.04	1.05	1.06	1.08
4-4	1.03	1.02	1.04	1.02	11-6 to 11-8	1.05	1.06	1.07	1.09
4-5	1.03	1.02	1.04	1.02	11-9 to 11-11	1.06	1.06	1.08	1.10
4-6	1.03	1.02	1.04	1.02	12-0 to 12-2	1.07	1.07	1.09	1.11
4-7	1.03	1.02	1.04	1.02	12-3 to 12-5	1.08	1.08	1.10	1.12
4-8	1.03	1.02	1.03	1.01	12-6 to 12-8	1.09	1.09	1.11	1.13
4-9	1.03	1.02	1.02	1.01	12-9 to 12-11	1.10	1.10	1.12	1.14
4-10	1.03	1.02	1.01	1.00	13-0 to 13-2	1.11	1.10	1.13	1.15
4-11	1.03	1.02	1.01	1.00	13-3 to 13-5	1.12	1.11	1.14	1.16
5-0	1.03	1.01	1.01	1.00	13-6 to 13-8	1.13	1.12	1.15	1.17
5-1	1.02	1.01	1.01	1.00	13-9 to 13-11	1.14	1.13	1.16	1.18
5-2	1.02	1.00	1.01	1.00	14-0 and up	1.16	1.15	1.17	1.20

1/ These factors were based on 42,242 records of cows that calved from November through June and on 29,619 records of those that calved from July through October.

ABLE 21.--JERSEY AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Idaho, Wyoming, Montana, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, and Hawaii 1/

Age in years and months	Adjustment factors by season of calving			
	November to June		July to October	
	Milk	Fat	Milk	Fat
-9	1.34	1.31	1.28	1.26
-10	1.31	1.28	1.25	1.24
-11	1.30	1.27	1.24	1.23
-0	1.29	1.26	1.23	1.22
-1	1.28	1.25	1.23	1.22
-2	1.27	1.25	1.22	1.21
-3	1.26	1.24	1.22	1.21
-4	1.25	1.23	1.22	1.20
-5	1.23	1.21	1.21	1.19
-6	1.23	1.21	1.20	1.19
-7	1.22	1.20	1.20	1.18
-8	1.21	1.19	1.19	1.17
-9	1.20	1.17	1.19	1.16
-10	1.19	1.15	1.18	1.14
-11	1.17	1.13	1.17	1.13
-0	1.16	1.12	1.15	1.12
-1	1.16	1.12	1.14	1.11
-2	1.15	1.11	1.13	1.10
-3	1.14	1.11	1.13	1.09
-4	1.13	1.10	1.13	1.09
-5	1.13	1.10	1.12	1.08
-6	1.12	1.09	1.12	1.08
-7	1.12	1.09	1.12	1.08
-8	1.11	1.09	1.11	1.08
-9	1.11	1.08	1.10	1.07
-10	1.10	1.06	1.09	1.06
-11	1.09	1.05	1.08	1.05
-0	1.08	1.04	1.08	1.04
-1	1.07	1.04	1.07	1.04
-2	1.07	1.03	1.06	1.03
-3	1.06	1.03	1.06	1.03
-4	1.05	1.03	1.06	1.03
-5	1.05	1.03	1.05	1.02
-6	1.05	1.03	1.05	1.02
-7	1.05	1.03	1.05	1.02
-8	1.05	1.03	1.05	1.02
-9	1.05	1.02	1.05	1.02
-10	1.05	1.02	1.05	1.02
-11	1.04	1.01	1.05	1.02
-0	1.04	1.01	1.05	1.02
-1	1.03	1.01	1.05	1.02
-2	1.03	1.01	1.04	1.02
5-3	1.03	1.01	1.04	1.02
5-4	1.03	1.01	1.03	1.01
5-5	1.03	1.01	1.03	1.01
5-6	1.03	1.01	1.03	1.01
5-7	1.02	1.01	1.03	1.01
5-8	1.02	1.01	1.03	1.01
5-9	1.02	1.01	1.03	1.01
5-10	1.02	1.00	1.03	1.01
5-11	1.02	1.00	1.03	1.01
6-0 to 6-2	1.02	1.00	1.03	1.01
6-3 to 6-5	1.02	1.00	1.03	1.01
6-6 to 6-8	1.02	1.00	1.02	1.01
6-9 to 6-11	1.02	1.00	1.02	1.00
7-0 to 7-2	1.01	1.00	1.01	1.00
7-3 to 7-5	1.01	1.00	1.01	1.00
7-6 to 7-8	1.01	1.00	1.01	1.00
7-9 to 7-11	1.01	1.00	1.01	1.00
8-0 to 8-2	1.00	1.00	1.00	1.00
8-3 to 8-5	1.00	1.00	1.00	1.00
8-6 to 8-8	1.00	1.00	1.00	1.00
8-9 to 8-11	1.00	1.00	1.00	1.00
9-0 to 9-2	1.00	1.00	1.00	1.01
9-3 to 9-5	1.00	1.00	1.00	1.01
9-6 to 9-8	1.00	1.01	1.01	1.01
9-9 to 9-11	1.01	1.02	1.01	1.02
10-0 to 10-2	1.01	1.02	1.01	1.02
10-3 to 10-5	1.01	1.02	1.02	1.02
10-6 to 10-8	1.01	1.02	1.02	1.03
10-9 to 10-11	1.01	1.02	1.02	1.03
11-0 to 11-2	1.01	1.02	1.02	1.03
11-3 to 11-5	1.01	1.03	1.02	1.04
11-6 to 11-8	1.02	1.03	1.02	1.04
11-9 to 11-11	1.02	1.04	1.02	1.04
12-0 to 12-2	1.02	1.04	1.03	1.04
12-3 to 12-5	1.03	1.05	1.03	1.05
12-6 to 12-8	1.03	1.05	1.03	1.05
12-9 to 12-11	1.04	1.06	1.03	1.05
13-0 to 13-2	1.04	1.06	1.03	1.05
13-3 to 13-5	1.04	1.06	1.03	1.06
13-6 to 13-8	1.05	1.07	1.03	1.06
13-9 to 13-11	1.05	1.07	1.03	1.06
14-0 and up	1.06	1.08	1.04	1.07

These factors were based on 60,217 records of cows that calved from November through June d on 31,260 records of those that calved from July through October.

TABLE 22.--BROWN SWISS AND RED DANE AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calved in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Idaho, Wyoming, Montana, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, and Hawaii 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.65	1.60	1.57	1.54	5-3	1.07	1.04	1.06	1.04
1-10	1.58	1.53	1.51	1.48	5-4	1.06	1.04	1.06	1.04
1-11	1.53	1.48	1.48	1.44	5-5	1.05	1.03	1.06	1.04
2-0	1.49	1.44	1.45	1.41	5-6	1.04	1.03	1.06	1.04
2-1	1.47	1.42	1.44	1.40	5-7	1.04	1.02	1.06	1.04
2-2	1.45	1.40	1.43	1.39	5-8	1.03	1.02	1.05	1.04
2-3	1.43	1.39	1.41	1.38	5-9	1.03	1.02	1.05	1.04
2-4	1.42	1.37	1.41	1.37	5-10	1.02	1.01	1.05	1.04
2-5	1.41	1.37	1.40	1.36	5-11	1.02	1.01	1.04	1.0
2-6	1.40	1.36	1.40	1.36	6-0 to 6-2	1.02	1.01	1.04	1.0
2-7	1.40	1.36	1.39	1.35	6-3 to 6-5	1.01	1.01	1.03	1.0
2-8	1.39	1.36	1.37	1.34	6-6 to 6-8	1.00	1.00	1.02	1.0
2-9	1.38	1.35	1.35	1.32	6-9 to 6-11	1.00	1.00	1.01	1.00
2-10	1.36	1.32	1.33	1.30	7-0 to 7-2	1.00	1.00	1.00	1.00
2-11	1.33	1.29	1.31	1.28	7-3 to 7-5	1.00	1.00	1.00	1.00
3-0	1.30	1.26	1.28	1.25	7-6 to 7-8	1.00	1.00	1.00	1.00
3-1	1.29	1.25	1.25	1.22	7-9 to 7-11	1.00	1.00	1.00	1.00
3-2	1.27	1.23	1.23	1.20	8-0 to 8-2	1.00	1.00	1.00	1.00
3-3	1.24	1.20	1.22	1.19	8-3 to 8-5	1.00	1.00	1.00	1.00
3-4	1.22	1.18	1.21	1.18	8-6 to 8-8	1.00	1.00	1.00	1.0
3-5	1.20	1.17	1.20	1.17	8-9 to 8-11	1.00	1.00	1.01	1.0
3-6	1.19	1.16	1.19	1.16	9-0 to 9-2	1.00	1.00	1.01	1.0
3-7	1.18	1.15	1.18	1.15	9-3 to 9-5	1.00	1.00	1.02	1.0
3-8	1.18	1.15	1.17	1.14	9-6 to 9-8	1.00	1.01	1.02	1.0
3-9	1.18	1.15	1.16	1.14	9-9 to 9-11	1.00	1.02	1.02	1.0
3-10	1.18	1.15	1.15	1.13	10-0 to 10-2	1.01	1.02	1.02	1.0
3-11	1.17	1.14	1.14	1.12	10-3 to 10-5	1.01	1.03	1.02	1.04
4-0	1.16	1.14	1.13	1.11	10-6 to 10-8	1.02	1.03	1.02	1.04
4-1	1.15	1.12	1.13	1.10	10-9 to 10-11	1.02	1.04	1.02	1.04
4-2	1.14	1.11	1.12	1.09	11-0 to 11-2	1.03	1.05	1.03	1.04
4-3	1.12	1.10	1.12	1.09	11-3 to 11-5	1.03	1.05	1.03	1.04
4-4	1.11	1.09	1.12	1.09	11-6 to 11-8	1.04	1.06	1.03	1.0
4-5	1.10	1.08	1.11	1.08	11-9 to 11-11	1.04	1.06	1.03	1.0
4-6	1.09	1.07	1.10	1.07	12-0 to 12-2	1.05	1.07	1.04	1.06
4-7	1.08	1.06	1.09	1.07	12-3 to 12-5	1.05	1.07	1.04	1.06
4-8	1.07	1.05	1.09	1.07	12-6 to 12-8	1.06	1.08	1.05	1.0
4-9	1.07	1.05	1.09	1.07	12-9 to 12-11	1.07	1.09	1.06	1.08
4-10	1.07	1.05	1.08	1.07	13-0 to 13-2	1.07	1.10	1.06	1.09
4-11	1.07	1.05	1.08	1.07	13-3 to 13-5	1.08	1.11	1.07	1.10
5-0	1.07	1.05	1.08	1.06	13-6 to 13-8	1.09	1.13	1.08	1.1
5-1	1.07	1.05	1.08	1.06	13-9 to 13-11	1.10	1.14	1.08	1.1
5-2	1.07	1.05	1.07	1.05	14-0 and up	1.12	1.16	1.08	1.1

1/ These factors were based on 27,199 records of cows that calved from November through June and on 16,250 records of those that calved from July through October.

TABLE 23.--BROWN SWISS AND RED DANE AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calved in Indiana, Illinois, Ohio, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas 1/

Age in years and months	Adjustment factors by season of calving			
	November to June		July to October	
	Milk	Fat	Milk	Fat
1-9	1.59	1.52	1.54	1.50
1-10	1.53	1.47	1.48	1.44
1-11	1.48	1.43	1.43	1.39
2-0	1.43	1.39	1.40	1.36
2-1	1.40	1.36	1.37	1.33
2-2	1.38	1.33	1.35	1.31
2-3	1.36	1.31	1.34	1.30
2-4	1.34	1.29	1.33	1.29
2-5	1.33	1.28	1.32	1.28
2-6	1.31	1.27	1.31	1.27
2-7	1.30	1.26	1.30	1.26
2-8	1.30	1.25	1.29	1.25
2-9	1.30	1.25	1.28	1.25
2-10	1.30	1.25	1.27	1.24
2-11	1.28	1.24	1.26	1.23
3-0	1.26	1.23	1.25	1.21
3-1	1.24	1.20	1.23	1.20
3-2	1.21	1.18	1.22	1.18
3-3	1.19	1.16	1.21	1.17
3-4	1.17	1.14	1.20	1.16
3-5	1.16	1.13	1.19	1.16
3-6	1.15	1.12	1.18	1.15
3-7	1.14	1.11	1.16	1.13
3-8	1.14	1.11	1.15	1.12
3-9	1.13	1.10	1.14	1.11
3-10	1.13	1.10	1.13	1.10
3-11	1.12	1.10	1.12	1.09
4-0	1.12	1.10	1.11	1.09
4-1	1.12	1.10	1.10	1.08
4-2	1.11	1.09	1.09	1.07
4-3	1.10	1.08	1.09	1.06
4-4	1.09	1.06	1.08	1.06
4-5	1.08	1.05	1.08	1.06
4-6	1.07	1.04	1.08	1.05
4-7	1.06	1.03	1.07	1.05
4-8	1.06	1.03	1.07	1.04
4-9	1.06	1.03	1.06	1.04
4-10	1.06	1.03	1.06	1.04
4-11	1.06	1.03	1.06	1.04
5-0	1.05	1.03	1.06	1.04
5-1	1.05	1.03	1.05	1.03
5-2	1.05	1.03	1.05	1.03
5-3	1.04	1.03	1.05	1.03
5-4	1.04	1.02	1.05	1.03
5-5	1.04	1.02	1.04	1.03
5-6	1.03	1.01	1.04	1.03
5-7	1.02	1.01	1.04	1.03
5-8	1.02	1.01	1.04	1.03
5-9	1.02	1.01	1.04	1.03
5-10	1.02	1.01	1.03	1.02
5-11	1.02	1.00	1.03	1.01
6-0 to 6-2	1.02	1.00	1.02	1.01
6-3 to 6-5	1.01	1.00	1.02	1.01
6-6 to 6-8	1.01	1.00	1.01	1.01
6-9 to 6-11	1.00	1.00	1.01	1.01
7-0 to 7-2	1.00	1.00	1.01	1.00
7-3 to 7-5	1.00	1.00	1.01	1.00
7-6 to 7-8	1.00	1.00	1.00	1.00
7-9 to 7-11	1.00	1.00	1.00	1.00
8-0 to 8-2	1.00	1.00	1.00	1.00
8-3 to 8-5	1.00	1.01	1.00	1.00
8-6 to 8-8	1.00	1.01	1.00	1.00
8-9 to 8-11	1.00	1.01	1.00	1.01
9-0 to 9-2	1.00	1.01	1.00	1.01
9-3 to 9-5	1.00	1.01	1.00	1.02
9-6 to 9-8	1.00	1.01	1.01	1.02
9-9 to 9-11	1.01	1.02	1.01	1.03
10-0 to 10-2	1.01	1.02	1.02	1.03
10-3 to 10-5	1.01	1.02	1.02	1.04
10-6 to 10-8	1.01	1.03	1.02	1.04
10-9 to 10-11	1.01	1.03	1.02	1.04
11-0 to 11-2	1.02	1.03	1.03	1.05
11-3 to 11-5	1.02	1.03	1.03	1.05
11-6 to 11-8	1.02	1.03	1.03	1.05
11-9 to 11-11	1.02	1.04	1.03	1.05
12-0 to 12-2	1.02	1.04	1.04	1.06
12-3 to 12-5	1.03	1.04	1.04	1.06
12-6 to 12-8	1.03	1.04	1.04	1.06
12-9 to 12-11	1.03	1.05	1.04	1.06
13-0 to 13-2	1.03	1.05	1.04	1.07
13-3 to 13-5	1.04	1.05	1.05	1.07
13-6 to 13-8	1.04	1.06	1.05	1.08
13-9 to 13-11	1.05	1.06	1.06	1.09
14-0 and up	1.06	1.07	1.07	1.11

1/ These factors were based on 73,199 records of cows that calved from November through June and on 43,671 records of those that calved from July through October.

TABLE 24.--BROWN SWISS AND RED DANE AGE ADJUSTMENT FACTORS for milk and fat production: for Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, and Texas 1/

Age in years and months	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
1-9	1.64	1.61	1.42	1.35	5-3	1.04	1.03	1.05	1.04
1-10	1.59	1.55	1.41	1.34	5-4	1.04	1.03	1.05	1.04
1-11	1.53	1.49	1.40	1.33	5-5	1.04	1.03	1.05	1.04
2-0	1.47	1.43	1.40	1.32	5-6	1.03	1.03	1.05	1.04
2-1	1.42	1.38	1.39	1.32	5-7	1.03	1.02	1.05	1.04
2-2	1.38	1.34	1.39	1.32	5-8	1.03	1.02	1.05	1.04
2-3	1.35	1.31	1.38	1.32	5-9	1.03	1.02	1.04	1.03
2-4	1.33	1.29	1.38	1.32	5-10	1.03	1.02	1.03	1.03
2-5	1.33	1.29	1.36	1.31	5-11	1.02	1.02	1.03	1.03
2-6	1.33	1.29	1.33	1.29	6-0 to 6-2	1.01	1.01	1.02	1.02
2-7	1.33	1.29	1.30	1.26	6-3 to 6-5	1.01	1.01	1.01	1.01
2-8	1.33	1.29	1.27	1.23	6-6 to 6-8	1.00	1.00	1.00	1.00
2-9	1.32	1.29	1.24	1.20	6-9 to 6-11	1.00	1.00	1.00	1.00
2-10	1.31	1.27	1.23	1.19	7-0 to 7-2	1.00	1.00	1.00	1.00
2-11	1.28	1.25	1.23	1.19	7-3 to 7-5	1.00	1.00	1.00	1.00
3-0	1.26	1.23	1.22	1.19	7-6 to 7-8	1.00	1.00	1.00	1.00
3-1	1.25	1.22	1.22	1.19	7-9 to 7-11	1.00	1.00	1.00	1.00
3-2	1.24	1.21	1.21	1.18	8-0 to 8-2	1.00	1.00	1.00	1.00
3-3	1.23	1.20	1.21	1.17	8-3 to 8-5	1.00	1.00	1.01	1.00
3-4	1.21	1.18	1.19	1.15	8-6 to 8-8	1.00	1.00	1.01	1.00
3-5	1.19	1.16	1.17	1.13	8-9 to 8-11	1.00	1.01	1.01	1.01
3-6	1.17	1.14	1.15	1.11	9-0 to 9-2	1.01	1.01	1.01	1.01
3-7	1.17	1.14	1.13	1.09	9-3 to 9-5	1.01	1.01	1.01	1.01
3-8	1.17	1.14	1.13	1.09	9-6 to 9-8	1.01	1.02	1.02	1.02
3-9	1.17	1.14	1.13	1.09	9-9 to 9-11	1.02	1.02	1.02	1.02
3-10	1.15	1.13	1.12	1.09	10-0 to 10-2	1.02	1.03	1.02	1.03
3-11	1.13	1.11	1.11	1.09	10-3 to 10-5	1.02	1.03	1.03	1.03
4-0	1.12	1.11	1.11	1.08	10-6 to 10-8	1.03	1.04	1.03	1.04
4-1	1.12	1.11	1.11	1.08	10-9 to 10-11	1.03	1.04	1.03	1.04
4-2	1.12	1.11	1.11	1.08	11-0 to 11-2	1.04	1.05	1.03	1.05
4-3	1.12	1.11	1.11	1.08	11-3 to 11-5	1.04	1.05	1.03	1.05
4-4	1.12	1.10	1.11	1.08	11-6 to 11-8	1.04	1.05	1.03	1.05
4-5	1.10	1.09	1.11	1.08	11-9 to 11-11	1.04	1.05	1.03	1.05
4-6	1.08	1.07	1.10	1.08	12-0 to 12-2	1.04	1.05	1.04	1.06
4-7	1.06	1.05	1.10	1.08	12-3 to 12-5	1.05	1.06	1.04	1.06
4-8	1.05	1.04	1.09	1.07	12-6 to 12-8	1.05	1.06	1.04	1.06
4-9	1.05	1.04	1.08	1.05	12-9 to 12-11	1.06	1.07	1.04	1.06
4-10	1.05	1.04	1.06	1.04	13-0 to 13-2	1.06	1.08	1.04	1.06
4-11	1.05	1.04	1.06	1.04	13-3 to 13-5	1.07	1.09	1.04	1.06
5-0	1.04	1.03	1.05	1.04	13-6 to 13-8	1.08	1.11	1.04	1.06
5-1	1.04	1.03	1.05	1.04	13-9 to 13-11	1.09	1.12	1.04	1.06
5-2	1.04	1.03	1.05	1.04	14-0 and up	1.11	1.14	1.04	1.06

1/ These factors were based on 6,799 records of cows that calved from November through June and on 5,129 records of those that calved from July through October.

ABLE 25.--MILKING SHORTHORN AND RED POLL AGE ADJUSTMENT FACTORS for milk and fat production of cows in all States

ge in ears and onths	Adjustment factors by season of calving				Age in years and months	Adjustment factors by season of calving			
	November to June		July to October			November to June		July to October	
	Milk	Fat	Milk	Fat		Milk	Fat	Milk	Fat
-9	1.54	1.52	1.48	1.44	5-3	1.10	1.08	1.08	1.06
-10	1.51	1.48	1.41	1.38	5-4	1.09	1.07	1.07	1.05
-11	1.47	1.43	1.37	1.34	5-5	1.08	1.07	1.07	1.05
-0	1.44	1.40	1.34	1.31	5-6	1.08	1.07	1.07	1.05
-1	1.41	1.37	1.32	1.29	5-7	1.08	1.07	1.06	1.05
-2	1.38	1.34	1.31	1.28	5-8	1.08	1.07	1.05	1.04
-3	1.36	1.32	1.30	1.27	5-9	1.08	1.07	1.05	1.04
-4	1.33	1.30	1.29	1.26	5-10	1.07	1.06	1.05	1.04
-5	1.32	1.28	1.28	1.25	5-11	1.07	1.06	1.05	1.04
-6	1.31	1.27	1.27	1.24	6-0 to 6-2	1.06	1.05	1.05	1.04
-7	1.31	1.27	1.26	1.23	6-3 to 6-5	1.05	1.04	1.04	1.03
-8	1.31	1.27	1.25	1.22	6-6 to 6-8	1.05	1.04	1.03	1.03
-9	1.30	1.26	1.24	1.21	6-9 to 6-11	1.04	1.04	1.02	1.02
-10	1.29	1.25	1.24	1.20	7-0 to 7-2	1.04	1.03	1.01	1.01
-11	1.28	1.25	1.24	1.20	7-3 to 7-5	1.03	1.03	1.00	1.01
-0	1.28	1.25	1.24	1.20	7-6 to 7-8	1.02	1.02	1.00	1.00
-1	1.27	1.24	1.24	1.20	7-9 to 7-11	1.01	1.01	1.00	1.00
-2	1.26	1.23	1.24	1.20	8-0 to 8-2	1.00	1.00	1.00	1.00
3	1.25	1.22	1.24	1.20	8-3 to 8-5	1.00	1.00	1.00	1.00
4	1.24	1.21	1.23	1.20	8-6 to 8-8	1.00	1.00	1.00	1.00
5	1.23	1.20	1.22	1.19	8-9 to 8-11	1.00	1.00	1.00	1.00
6	1.22	1.19	1.21	1.18	9-0 to 9-2	1.00	1.00	1.00	1.00
7	1.21	1.18	1.19	1.17	9-3 to 9-5	1.00	1.00	1.00	1.00
8	1.20	1.18	1.18	1.16	9-6 to 9-8	1.00	1.00	1.00	1.00
9	1.20	1.17	1.17	1.15	9-9 to 9-11	1.00	1.01	1.00	1.00
10	1.20	1.17	1.16	1.14	10-0 to 10-2	1.01	1.01	1.00	1.00
11	1.19	1.16	1.15	1.14	10-3 to 10-5	1.01	1.01	1.00	1.00
0	1.18	1.15	1.15	1.14	10-6 to 10-8	1.01	1.02	1.00	1.00
1	1.17	1.14	1.15	1.13	10-9 to 10-11	1.01	1.02	1.00	1.00
2	1.16	1.14	1.14	1.12	11-0 to 11-2	1.01	1.02	1.00	1.01
3	1.15	1.13	1.13	1.11	11-3 to 11-5	1.01	1.02	1.01	1.01
4	1.14	1.12	1.12	1.10	11-6 to 11-8	1.01	1.02	1.01	1.01
5	1.14	1.12	1.11	1.09	11-9 to 11-11	1.01	1.02	1.01	1.01
6	1.13	1.11	1.11	1.09	12-0 to 12-2	1.01	1.03	1.01	1.01
7	1.13	1.11	1.10	1.08	12-3 to 12-5	1.02	1.03	1.01	1.01
8	1.13	1.11	1.09	1.08	12-6 to 12-8	1.02	1.03	1.01	1.01
9	1.13	1.11	1.08	1.07	12-9 to 12-11	1.02	1.03	1.01	1.02
10	1.12	1.11	1.08	1.07	13-0 to 13-2	1.02	1.03	1.01	1.02
11	1.12	1.11	1.08	1.07	13-3 to 13-5	1.02	1.04	1.01	1.02
	1.12	1.11	1.08	1.07	13-6 to 13-8	1.02	1.04	1.01	1.03
	1.12	1.10	1.08	1.07	13-9 to 13-11	1.02	1.04	1.01	1.03
	1.11	1.09	1.08	1.06	14-0 and up	1.03	1.05	1.02	1.04

TABLE 26.--MIXED BREED AGE ADJUSTMENT FACTORS for milk and fat production of cows in all States[1]

Age in years and months	Adjustment factors by season of calving			
	November to June		July to October	
	Milk	Fat	Milk	Fat
1-9	1.43	1.39	1.36	1.33
1-10	1.38	1.34	1.31	1.28
1-11	1.35	1.30	1.28	1.25
2-0	1.32	1.28	1.27	1.24
2-1	1.30	1.27	1.26	1.22
2-2	1.29	1.25	1.25	1.22
2-3	1.28	1.24	1.24	1.21
2-4	1.27	1.23	1.23	1.20
2-5	1.25	1.22	1.23	1.20
2-6	1.25	1.22	1.22	1.19
2-7	1.25	1.21	1.21	1.18
2-8	1.24	1.20	1.20	1.17
2-9	1.24	1.20	1.19	1.16
2-10	1.23	1.19	1.18	1.15
2-11	1.21	1.18	1.18	1.14
3-0	1.20	1.16	1.17	1.13
3-1	1.19	1.15	1.16	1.13
3-2	1.17	1.14	1.15	1.12
3-3	1.16	1.13	1.15	1.11
3-4	1.15	1.12	1.14	1.11
3-5	1.14	1.11	1.14	1.11
3-6	1.13	1.10	1.14	1.10
3-7	1.13	1.10	1.13	1.09
3-8	1.13	1.10	1.12	1.09
3-9	1.12	1.10	1.11	1.08
3-10	1.12	1.09	1.10	1.07
3-11	1.11	1.08	1.09	1.07
4-0	1.10	1.07	1.08	1.06
4-1	1.09	1.06	1.08	1.05
4-2	1.08	1.06	1.07	1.04
4-3	1.08	1.05	1.07	1.04
4-4	1.06	1.04	1.06	1.04
4-5	1.06	1.04	1.06	1.03
4-6	1.05	1.04	1.06	1.03
4-7	1.05	1.03	1.05	1.03
4-8	1.05	1.03	1.05	1.03
4-9	1.05	1.03	1.04	1.02
4-10	1.05	1.03	1.04	1.02
4-11	1.05	1.03	1.04	1.02
5-0	1.04	1.03	1.03	1.02
5-1	1.04	1.02	1.03	1.01
5-2	1.04	1.02	1.03	1.01
5-3	1.04	1.02	1.03	1.01
5-4	1.03	1.02	1.03	1.01
5-5	1.03	1.02	1.03	1.01
5-6	1.02	1.01	1.03	1.01
5-7	1.02	1.01	1.03	1.01
5-8	1.02	1.01	1.02	1.01
5-9	1.02	1.01	1.02	1.01
5-10	1.02	1.01	1.02	1.01
5-11	1.02	1.01	1.02	1.00
6-0 to 6-2	1.01	1.00	1.01	1.00
6-3 to 6-5	1.01	1.00	1.01	1.00
6-6 to 6-8	1.01	1.00	1.01	1.00
6-9 to 6-11	1.01	1.00	1.01	1.00
7-0 to 7-2	1.00	1.00	1.00	1.00
7-3 to 7-5	1.00	1.00	1.00	1.00
7-6 to 7-8	1.00	1.00	1.00	1.00
7-9 to 7-11	1.00	1.00	1.00	1.00
8-0 to 8-2	1.00	1.00	1.00	1.00
8-3 to 8-5	1.00	1.00	1.00	1.01
8-6 to 8-8	1.00	1.01	1.00	1.01
8-9 to 8-11	1.00	1.01	1.01	1.01
9-0 to 9-2	1.00	1.01	1.01	1.01
9-3 to 9-5	1.00	1.01	1.01	1.02
9-6 to 9-8	1.01	1.02	1.01	1.02
9-9 to 9-11	1.01	1.02	1.02	1.03
10-0 to 10-2	1.01	1.03	1.02	1.03
10-3 to 10-5	1.02	1.03	1.02	1.03
10-6 to 10-8	1.02	1.03	1.02	1.04
10-9 to 10-11	1.02	1.04	1.02	1.04
11-0 to 11-2	1.02	1.04	1.03	1.04
11-3 to 11-5	1.03	1.04	1.03	1.04
11-6 to 11-8	1.03	1.04	1.03	1.04
11-9 to 11-11	1.03	1.05	1.03	1.05
12-0 to 12-2	1.04	1.05	1.03	1.05
12-3 to 12-5	1.04	1.06	1.04	1.05
12-6 to 12-8	1.04	1.06	1.04	1.06
12-9 to 12-11	1.05	1.07	1.04	1.06
13-0 to 13-2	1.05	1.07	1.05	1.07
13-3 to 13-5	1.06	1.08	1.05	1.07
13-6 to 13-8	1.06	1.08	1.06	1.08
13-9 to 13-11	1.07	1.09	1.06	1.09
14-0 and up	1.08	1.10	1.07	1.10

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[1] Computed by averaging the factors for all breeds.

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National Cooperative Dairy Herd Improvement Program
RECORD BOOK
A plan for every size herd
STANDARD DHIA
OWNER SAMPLER
WEIGH-A-DAY-A-MONTH
AGRICULTURAL RESEARCH SERVICE. U. S. DEPARTMENT OF AGRICULTURE

Dairy-Herd-Improvement Letter
ARS-44-190
(Vol. 43, No. 2)

March 1967

DHIA PARTICIPATION REPORT [1/]
January 1, 1967

The National Cooperative Dairy Herd Improvement Program is a composite of the Standard (including DHIR), Owner-Sampler, and Weigh-a-Day-a-Month recordkeeping plans. On January 1, 1967, the Program included 64,123 herds consisting of 2,977,475 cows on test, which is 21.1 percent of the nation's dairy cow population. These figures represent an increase of 2.0 percent of cows on test, an increase of 22,088 cows, and a decrease of 2,175 herds during the year. Table 1 presents this data and also includes 984 herds and 52,998 cows on other testing programs such as Vocational Agriculture, commercial, private, etc.

Each of the 50 States and Puerto Rico are represented in the total program that includes 1,344 associations and 2,319 supervisors. The participation reports for all testing programs and for the Standard, Owner-Sampler, and Weigh-a-Day-a-Month plans are shown in tables 1, 2, 3, and 4, respectively.

On January 1, 1967, 1,196 fewer herds and 40,327 more cows were on Standard test than in the previous year. Average herd size was 55.7 cows, an increase of 2.8 cows per herd over the previous year. Milk production of Standard DHIA cows has increased consistently since 1957 at a rate of 223 pounds per

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[1/] Prepared by C. A. Rampendahl, R. D. Plowman, and B. T. McDaniel from data supplied by the State Extension Dairymen in charge of DHIA Testing.

Issued April 1967

year. Milk fat has slightly but steadily declined at an average annual rate of 0.012 percent per year since 1957. The changes in milk production and milk fat are partly a reflection of a change in breed proportions. Herd size and the percentage of milk fat agree closely with the estimates for all U.S. dairy cows.

On January 1, 1967, 820 fewer herds and 14,711 fewer cows were on the Owner-Sampler test than in the previous year. Average herd size was 32.4 cows. Wisconsin had 42.4 percent of the Owner-Sampler enrollment. The Weigh-a-Day-a-Month plan had 1,001 herds consisting of 53,429 cows. Average herd size for this plan was 53.4 cows.

Electronic data processing at State and regional DHIA centers continues to advance as shown in table 5. Electronic processing of Standard plan records (including DHIR) has reached 100 percent in 38 States. In the United States, it includes 94.5 percent of the herds and 85.0 percent of the cows on Standard DHIA. The corresponding values for records of the three plans combined are 87.6 and 82.0 percent, respectively.

In 1966, 99.5 percent of the lactation records reported to USDA were centrally processed. The benefits to be derived from centrally processed DHIA herdbooks and records have been thoroughly demonstrated during the last 10 years. It is hoped that dairymen who have not converted to the improved system will do so soon.

The present status and changes since 1906 in Standard DHIA enrollment are shown in table 6. The number of cows in the program has about doubled since 1950, although the number of herds tested has dropped slightly.

Table 7 is a 10-year summary of the production of Standard DHIA and all U.S. dairy cows. Table 8 shows that the proportion of cows participating in the total DHIA program increased from 9.3 percent in 1956 to 21.1 percent in 1966.

A list of the 222 counties having 40 percent or more of their dairy cows on one or more of the recordkeeping plans is shown in table 9. Twenty-one percent of the counties have 25 percent or more of their dairy cattle enrolled in one or more recordkeeping plans.

LACTATION RECORDS REPORTED IN 1966

The number of lactation records reported to the USDA for genetic appraisal and research was 1,788,974 in 1966. This is 39,222 more than in 1965. Of these, 55.4 percent were reported on magnetic tape, 44.1 percent on punched USDA 1095 cards, and 0.5 percent on hand-recorded USDA 718 cards. These figures are summarized by State in table 10.

Since 1956, the number of cows enrolled in Standard DHIA has increased 46 percent, while the number of lactation records reported to the USDA has increased 172 percent. As a result, the proportion of cows on test having reported records has increased from 47 to 87 percent since 1956. This more complete reporting is attributed largely to the continued development of central processing of Standard DHIA records. A summary of the records reported since 1956 is shown in table 11.

LACTATION RECORD REJECTS

Rejects amounted to 9.6 percent of all records received and reconciled in 1966. The relative frequency of Standard DHIA lactation record rejects in 1966 by type of reject is given in table 12. Conflictions on birth dates have continued to be the most numerous classification of edit rejects.

SIRES SUMMARIZED IN 1966

In the four quarterly sire evaluations in 1966, 17,239 summaries were made of sires in DHIA. Individual sire records sent to the States are given by breed in table 13. Seventy-eight percent of the sire summaries represented sires in natural service, averaging 14.0 daughter-herdmate comparisons per summary and a total of 187,890 progeny. The remaining 22 percent included summaries for sires used in artificial insemination and 1,036,121 daughters, averaging 273 daughter-herdmate comparisons per summary.

During 1966, a total of 52,269 copies of individual sire summaries were made available to the cooperating States.

DHIA COWS INDEXED IN 1966

A total of 11,659 DHIA cows, representing the top 2 percent of registered progeny of bulls summarized in 1966, were indexed in the two evaluations performed.

ERRATUM: For February 1967 Dairy Herd Improvement Letter, ARS-44-188, "DHIA Age Adjustment Factors."

1. Table 4, page 7. Maximum production for Holstein cows calving from November through June in Region 1 (Northeast) should be 13,868 pounds instead of the 13,368 as shown.

2. Table 12, page 18. Part of the title was omitted because of printing failure and should read: TABLE 12.--HOLSTEIN AGE ADJUSTMENT FACTORS for milk and fat production: for cows that calve in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, and New York 1/

TABLE 1.--The National Cooperative Dairy Herd Improvement Program and other testing programs
(January 1, 1967)

State	Counties	Asso-ciations	Super-visors	Standard		Owner-Sampler		Weigh-a-Day-a-Month		Total		Milk cows in U.S.	
				Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Total 1/	In all plans
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Thousands	Percent
Ala------	55	23	24	330	30,821	5	300	18	1,246	353	32,367	158	20.5
Alaska---	2	2	2	4	165	4	150	--	-----	8	315	2	15.8
Ariz-----	5	4	10	88	16,544	---	---	--	-----	88	16,544	52	31.8
Ark------	31	9	9	79	3,800	96	2,700	15	500	190	7,000	116	6.0
Calif----	43	30	118	1,862	362,452	142	8,886	--	-----	2,004	371,338	772	48.1
Colo-----	15	12	22	199	14,253	15	730	--	-----	214	14,983	99	15.1
Conn-----	8	8	23	412	22,678	83	3,302	--	-----	495	25,980	70	37.1
Del------	3	3	5	87	4,461	10	246	3	54	100	4,761	17	28.0
Fla------	30	10	11	121	20,089	6	2,068	18	5,358	145	27,515	179	15.4
Ga-------	90	31	32	391	31,116	6	385	42	4,838	439	36,339	150	24.2
Hawaii---	2	1	2	19	4,480	1	26	--	-----	20	4,506	15	30.0
Idaho----	28	36	34	547	30,715	21	601	--	-----	568	31,316	162	19.3
Ill------	83	53	80	1,451	61,352	400	13,215	274	8,151	2,125	82,718	389	21.3
Ind------	84	59	75	1,060	43,142	442	29,555	--	-----	1,502	72,697	301	24.2
Iowa-----	97	71	95	1,662	59,470	1,445	37,045	--	-----	3,107	96,515	657	14.7
Kans-----	92	56	58	785	35,328	125	3,976	10	300	920	39,604	228	17.4
Ky-------	72	38	44	513	22,048	44	1,575	59	2,083	616	25,706	396	6.5
La-------	34	25	27	82	7,484	8	551	198	12,830	288	20,865	196	10.6
Maine----	16	13	26	395	17,853	99	3,758	1	33	495	21,644	74	29.2
Md-------	17	17	32	678	40,122	75	3,165	--	-----	753	43,287	180	24.0
Mass-----	11	10	23	456	21,164	78	2,655	--	-----	534	23,819	74	32.2
Mich-----	79	67	102	1,741	81,341	1,451	49,075	--	-----	3,192	130,416	544	24.0
Minn-----	85	83	202	3,593	122,241	2,372	64,590	--	-----	5,965	186,831	1,146	16.3
Miss-----	46	19	23	243	18,698	1	71	50	2,500	294	21,269	242	8.8
Mo-------	76	47	53	472	24,011	144	4,165	--	-----	616	28,176	422	6.7
Mont-----	13	6	8	68	3,378	37	1,676	--	-----	105	5,054	53	9.5
Nebr-----	62	29	30	375	16,696	83	2,816	43	946	501	20,458	239	8.6
Nev------	6	2	3	63	6,446	2	1,135	--	-----	65	7,581	13	58.3
N. H-----	10	9	17	258	12,332	60	2,210	7	368	325	14,910	41	36.4
N. J-----	14	9	24	437	25,235	39	1,853	--	-----	476	27,088	97	27.9
N. Mex---	12	4	6	30	6,244	5	1,613	13	1,404	48	9,261	38	24.4
N. Y-----	54	49	175	3,788	181,758	2,654	95,823	--	-----	6,442	277,581	1,109	25.0
N. C-----	81	40	49	759	47,669	37	1,479	69	3,333	865	52,481	210	25.0
N. Dak---	38	16	14	155	6,100	41	820	23	573	219	7,493	196	3.8
Ohio-----	88	80	164	2,230	90,856	1,446	41,000	--	-----	3,676	131,856	523	25.2
Okla-----	52	15	20	231	14,163	46	2,357	4	123	281	16,643	168	9.9
Oreg-----	28	16	20	392	26,300	120	3,600	--	-----	512	29,900	122	24.5
Pa-------	67	59	190	4,443	179,732	1,337	39,308	--	-----	5,780	219,040	767	28.6
P. R-----	4	1	1	7	893	---	---	28	4,439	35	5,332	---	----
R. I-----	5	2	3	45	2,192	---	---	--	-----	45	2,192	10	21.9
S. C-----	35	24	24	263	24,880	2	196	12	664	277	25,740	77	33.4
S. Dak---	45	18	20	160	6,650	380	11,600	--	-----	540	18,250	213	8.6
Tenn-----	53	42	39	509	30,429	7	226	41	1,213	557	31,868	373	8.5
Tex------	81	26	30	330	29,050	18	1,116	10	640	358	30,806	402	7.7
Utah-----	22	15	17	399	20,318	33	1,034	--	-----	432	21,352	77	27.7
Vt-------	14	28	63	759	39,064	636	27,664	--	-----	1,395	66,728	215	31.0
Va-------	81	39	53	984	59,065	58	2,146	3	359	1,045	61,570	250	24.6
Wash-----	32	22	40	540	37,060	36	1,189	--	-----	576	38,249	199	19.2
W. Va----	30	11	16	177	8,791	23	807	60	1,474	260	11,072	79	14.0
Wis------	69	50	155	2,980	126,362	11,241	349,547	--	-----	14,221	475,909	1,989	23.9
Wyo------	9	5	6	31	1,428	25	1,122	--	-----	56	2,550	22	11.6
Total or percent: The Natl. Coop. DHI Program	2,109	1,344	2,319	37,683	2,098,919	25,439	825,127	1,001	53,429	64,123	2,977,475	14,123	21.1
All testing programs 2/	—	—	—	—	—	—	—	—	—	65,107	3,030,473	—	21.5

/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Sta-
istical Reporting Service.

/ The following number of herds and cows are on other testing programs such as Vocational-Agriculture, commercial, private, etc.,
y State: Arizona, 68 herds, 12,556 cows; California, 34 herds, 7,541 cows; Colorado, 39 herds, 2,807 cows; Connecticut, 20 herds,
,000 cows; Michigan, 254 herds, 7,500 cows; New Mexico, 20 herds, 2,880 cows; North Dakota, 54 herds, 1,325 cows; Oklahoma, 23
erds, 800 cows; Oregon, 8 herds, 700 cows; Washington, 14 herds, 939 cows; Wisconsin, 450 herds, 13,950 cows.
otal = 984 herds, 52,998 cows.

TABLE 2.--Standard DHIA recordkeeping in the United States
(January 1, 1967)

State	Counties	Herds	Cows	Change from 1-1-66	Av. cows per herd	All milk cows 1/	DHIA cows as pct. of all milk cows 2/	Change from 1-1-66
	Number	Number	Number	Number	Number	Thousands	Percent	Percent
Ala	53	330	30,821	+1,904	93.4	158	19.5	+4.6
Alaska	2	4	165	-31	41.3	2	8.3	-1.5
Ariz	5	88	16,544	+588	188.0	52	31.8	+0.5
Ark	16	79	3,800	+363	48.1	116	3.3	+1.2
Calif	42	1,862	362,452	+16,311	194.7	772	46.9	+2.7
Colo	15	199	14,253	-1,273	71.6	99	14.4	-.2
Conn	8	412	22,678	+14	55.0	70	32.4	+.9
Del	3	87	4,461	-283	51.3	17	26.2	+4.6
Fla	28	121	20,089	+1,071	166.0	179	11.2	+.5
Ga	86	391	31,116	+1,566	79.6	150	20.7	+3.3
Hawaii	1	19	4,480	+2,180	235.8	15	29.9	+14.6
Idaho	28	547	30,715	+5,732	56.2	162	19.0	+5.0
Ill	80	1,451	61,352	+250	42.3	389	15.8	+2.1
Ind	83	1,060	43,142	-3,086	40.7	301	14.3	+1.6
Iowa	94	1,662	59,470	-170	35.8	657	9.1	+1.0
Kans	90	785	35,328	+1,577	45.0	228	15.5	+2.9
Ky	72	513	22,048	+48	43.0	396	5.6	+.5
La	25	82	7,484	+1,555	91.3	196	3.8	+.9
Maine	16	395	17,853	-255	45.2	74	24.1	+2.0
Md	17	678	40,122	-4,774	59.2	180	22.3	+.2
Mass	11	456	21,164	+396	46.4	74	28.6	+2.3
Mich	70	1,741	81,341	-3,893	46.7	544	15.0	+.9
Minn	85	3,593	122,241	-1,862	34.0	1,146	10.7	+.6
Miss	44	243	18,698	+1,461	76.9	242	7.7	+1.3
Mo	75	472	24,011	+4,539	50.9	422	5.7	+2.1
Mont	6	68	3,378	-105	49.7	53	6.4	+1.0
Nebr	52	375	16,696	+1,212	44.5	239	7.0	+1.3
Nev	6	63	6,446	+2,320	102.3	13	49.6	+20.1
N. H.	10	258	12,332	-283	47.8	41	30.1	+.8
N. J.	14	437	25,235	-38	57.7	97	26.0	+2.4
N. Mex	8	30	6,244	+2,450	208.1	38	16.4	+6.9
N. Y.	49	3,788	181,758	+1,907	48.0	1,109	16.4	+1.1
N. C.	81	759	47,669	+1,168	62.8	210	22.7	+2.7
N. Dak	33	155	6,100	+571	39.4	196	3.1	+.7
Ohio	88	2,230	90,856	-3,279	40.7	523	17.4	+.8
Okla	48	231	14,163	+1,297	61.3	168	8.4	+1.6
Oreg	28	392	26,300	+390	67.1	122	21.6	+1.5
Pa	67	4,443	179,732	+4,169	40.5	767	23.4	+1.1
P. R.	3	7	893	-3,682	127.6	---	----	----
R. I.	5	45	2,192	-253	48.7	10	21.9	-2.6
S. C.	34	263	24,880	+2,504	94.6	77	32.3	+6.6
S. Dak	32	160	6,650	-92	41.6	213	3.1	+.1
Tenn	53	509	30,429	+1,775	59.8	373	8.2	+1.7
Tex	78	330	29,050	+930	88.0	402	7.2	+1.1
Utah	18	399	20,318	-673	50.9	77	26.4	+1.7
Vt	14	759	39,064	-7,959	51.5	215	18.2	-1.9
Va	81	984	59,065	+1,416	60.0	250	23.6	+3.0
Wash	32	540	37,060	+10,715	68.6	199	18.6	+6.3
W. Va	23	177	8,791	+2,178	49.7	79	11.1	+4.6
Wis	69	2,980	126,362	-2,533	42.4	1,989	6.4	+.2
Wyo	5	31	1,428	+294	46.1	22	6.5	+2.0
Total, average, or percent	1,986	37,683	2,098,919	+40,327	55.7	14,123	14.9	+1.6

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service.

2/ Percentage of cows included in the Standard (including DHIR) recordkeeping plan.

TABLE 3.--Owner-Sampler recordkeeping in the United States
(January 1, 1967)

State	Counties	Herds	Cows	Change from 1-1-66	Av. cows per herd	All milk cows 1/	O.S. cows as pct. of all milk cows 2/	Change from 1-1-66
	Number	Number	Number	Number	Number	Thousands	Percent	Percent
Ala------------	3	5	300	-469	60.0	158	0.2	-.2
Alaska---------	1	4	150	+15	37.5	2	7.5	+.7
Ariz-----------	--	---	---	-8,852	----	52	---	-17.4
Ark------------	12	96	2,700	+1,060	28.1	116	2.3	+1.3
Calif----------	19	142	8,886	-13,026	62.6	772	1.2	-1.6
Colo-----------	6	15	730	-223	48.7	99	.7	-.2
Conn-----------	8	83	3,302	-1,523	39.8	70	4.7	-2.0
Del------------	2	10	246	-67	24.6	17	1.4	0
Fla------------	5	6	2,068	+626	344.7	179	1.2	+.4
Ga-------------	2	6	385	+154	64.2	150	.3	+.2
Hawaii---------	1	1	26	+26	26.0	15	.2	+.2
Idaho----------	12	21	601	+214	28.6	162	.4	+.2
Ill------------	30	400	13,215	-673	33.0	389	3.4	+.3
Ind------------	17	442	29,555	+19,248	66.9	301	9.8	+7.0
Iowa-----------	88	1,445	37,045	-2,000	25.6	657	5.6	+.3
Kans-----------	30	125	3,976	+371	31.8	228	1.7	+.4
Ky-------------	27	44	1,575	+18	35.8	396	.4	0
La-------------	3	8	551	-562	68.9	196	.3	-.2
Maine----------	12	99	3,758	-8	38.0	74	5.1	+.5
Md-------------	8	75	3,165	-779	42.2	180	1.8	-.1
Mass-----------	8	78	2,655	-13	34.0	74	3.6	+.2
Mich-----------	73	1,451	49,075	-6,629	33.8	544	9.0	-.2
Minn-----------	84	2,372	64,590	+3,941	27.2	1,146	5.6	+.7
Miss-----------	1	1	71	-37	71.0	242	---	----
Mo-------------	27	144	4,165	+2,348	28.9	422	1.0	+.7
Mont-----------	6	37	1,676	-1,800	45.3	53	3.2	-2.1
Nebr-----------	20	83	2,816	-84	33.9	239	1.2	+.1
Nev------------	2	2	1,135	-34	567.5	13	8.7	+.3
N. H-----------	10	60	2,210	-270	36.8	41	5.4	-.4
N. J-----------	9	39	1,853	+3	47.5	97	1.9	+.2
N. Mex---------	2	5	1,613	-23	322.6	38	4.2	+.1
N. Y-----------	54	2,654	95,823	-3,032	36.1	1,109	8.6	+.2
N. C-----------	19	37	1,479	-294	40.0	210	.7	-.1
N. Dak---------	18	41	820	-238	20.0	196	.4	-.1
Ohio-----------	80	1,446	41,000	+903	28.4	523	7.8	+.7
Okla-----------	21	46	2,357	+1,245	51.2	168	1.4	+.8
Oreg-----------	28	120	3,600	-30	30.0	122	3.0	+.2
Pa-------------	61	1,337	39,308	+1,194	29.4	767	5.1	+.3
P. R-----------	--	---	-----	------	----	---	---	----
R. I-----------	--	---	-----	-19	----	10	---	-.2
S. C-----------	2	2	196	+149	98.0	77	.3	+.2
S. Dak---------	45	380	11,600	+3,336	30.5	213	5.4	+1.7
Tenn-----------	5	7	226	+55	32.3	373	.1	+.1
Tex------------	8	18	1,116	+316	62.0	402	.3	+.1
Utah-----------	6	33	1,034	-113	31.3	77	1.3	0
Vt-------------	14	636	27,664	+8,186	43.5	215	12.9	+4.6
Va-------------	12	58	2,146	+328	37.0	250	.9	+.3
Wash-----------	12	36	1,189	+223	33.0	199	.6	+.1
W. Va----------	6	23	807	+161	35.1	79	1.0	+.4
Wis------------	69	11,241	349,547	-17,656	31.1	1,989	17.6	-.1
Wyo------------	4	25	1,122	-377	44.9	22	5.1	-.9
Total, average, or percent--	992	25,439	825,127	-14,711	32.4	14,123	5.8	+.4

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service.
2/ Percentage of cows included in the Owner-Sampler recordkeeping plan.

TABLE 4.--Weigh-a-Day-a-Month recordkeeping in the United States
(January 1, 1967)

State	Counties	Herds	Cows	Change from 1-1-66	Av. cows per herd	All milk cows 1/	WADAM cows as pct. of all milk cows 2/	Change from 1-1-66
	Number	Number	Number	Number	Number	Thousands	Percent	Percent
Ala.	13	18	1,246	-231	69.2	158	0.8	0
Alaska	--	---	-----	------	----	2	---	----
Ariz.	--	---	-----	------	----	52	---	----
Ark.	3	15	500	+140	33.3	116	.4	+.2
Calif.	--	---	-----	------	----	772	---	----
Colo.	--	---	-----	------	----	99	---	----
Conn.	--	---	-----	------	----	70	---	----
Del.	1	3	54	-2	18.0	17	.3	0
Fla.	9	18	5,358	+654	297.7	179	3.0	+.4
Ga.	18	42	4,838	-950	115.2	150	3.2	-.2
Hawaii	--	---	-----	-132	----	15	---	-.9
Idaho	--	---	-----	------	----	162	---	----
Ill.	40	274	8,151	+574	29.7	389	2.1	+.4
Ind.	--	---	-----	------	----	301	---	----
Iowa	--	---	-----	-250	----	657	---	----
Kans.	5	10	300	0	30.0	228	.1	0
Ky.	35	59	2,083	+238	35.3	396	.5	+.1
La.	24	198	12,830	+2,363	64.8	196	6.5	+1.3
Maine	1	1	33	-167	33.0	74	---	-.2
Md.	--	---	-----	------	----	180	---	----
Mass.	--	---	-----	------	----	74	---	----
Mich.	--	---	-----	------	----	544	---	----
Minn.	--	---	-----	------	----	1,146	---	----
Miss.	8	50	2,500	-500	50.0	242	1.0	-.1
Mo.	--	---	-----	-2,693	----	422	---	-.5
Mont.	--	---	-----	------	----	53	---	----
Nebr.	17	43	946	+646	22.0	239	.4	+.3
Nev.	--	---	-----	------	----	13	---	----
N. H.	2	7	368	+215	52.6	41	.9	+.5
N. J.	--	---	-----	-165	----	97	---	-.2
N. Mex.	4	13	1,404	-691	108.0	38	3.7	-1.5
N. Y.	--	---	-----	------	----	1,109	---	----
N. C.	31	69	3,333	-867	48.3	210	1.6	-.2
N. Dak.	18	23	573	-779	24.9	196	.3	-.3
Ohio	--	---	-----	-154	----	523	---	----
Okla.	2	4	123	-115	30.8	168	.1	0
Oreg.	--	---	-----	-150	----	122	---	-.1
Pa.	--	---	-----	------	----	767	---	----
P. R.	4	28	4,439	-81	158.5	---	---	----
R. I.	--	---	-----	------	----	10	---	----
S. C.	4	12	664	+19	55.3	77	.9	+.2
S. Dak.	--	---	-----	------	----	213	---	----
Tenn.	18	41	1,213	-414	29.6	373	.3	-.1
Tex.	4	10	640	-50	64.0	402	.2	0
Utah	--	---	-----	------	----	77	---	----
Vt.	--	---	-----	------	----	215	---	----
Va.	3	3	359	+24	119.7	250	.1	0
Wash.	--	---	-----	------	----	199	---	----
W. Va.	18	60	1,474	-10	24.6	79	1.9	+.4
Wis.	--	---	-----	------	----	1,989	---	----
Wyo.	--	---	-----	------	----	22	---	----
Total, average, or percent	282	1,001	53,429	-3,528	53.4	14,123	.4	0

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service.
2/ Percentage of cows included in the Weigh-a-Day-a-Month recordkeeping plan.

TABLE 5.--Herds and cows enrolled in State and regional computing centers
(January 1, 1967)

State	Standard DHIA (Incl. DHIR)				Dairy Herd Improvement Registry		Owner-Sampler		Total machine processing 1/		Machine-processing as percent of total recordkeeping 1/	
	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows
	Number	Number	Pct.2/	Pct.2/	Number	Number	Number	Number	Number	Number	Pct.	Pct.
Ala-------	330	30,821	100.0	100.0	14	1,164	5	300	335	31,121	94.9	96.2
Alaska----	4	165	100.0	100.0	2	65	4	150	8	315	100.0	100.0
Ariz------	39	5,729	44.3	34.6	16	2,621	---	-----	39	5,729	44.3	34.6
Ark-------	79	3,800	100.0	100.0	14	700	96	2,700	175	6,500	92.1	92.9
Calif-----	319	78,839	17.1	21.8	89	17,208	2	328	321	79,167	16.0	21.3
Colo------	199	14,253	100.0	100.0	35	2,100	15	730	214	14,983	100.0	100.0
Conn------	412	22,678	100.0	100.0	84	4,566	80	3,156	492	25,834	99.4	99.4
Del-------	87	4,461	100.0	100.0	8	454	10	246	97	4,707	97.0	98.9
Fla-------	121	20,089	100.0	100.0	10	1,497	4	1,758	125	21,847	86.2	79.4
Ga--------	391	31,116	100.0	100.0	33	3,223	6	385	424	34,976	96.6	96.2
Hawaii----	15	3,832	78.9	85.5	--	-----	1	26	16	3,858	80.0	85.6
Idaho-----	509	28,839	93.1	93.9	43	2,187	21	601	530	29,440	93.3	94.0
Ill------	1,451	61,352	100.0	100.0	165	7,358	245	8,064	1,827	73,699	86.0	89.1
Ind------	1,060	43,142	100.0	100.0	191	7,377	79	2,804	1,139	45,946	75.8	63.2
Iowa-----	1,662	59,470	100.0	100.0	227	7,988	1,246	32,019	2,908	91,489	93.6	94.8
Kans-----	785	35,328	100.0	100.0	125	4,005	125	3,976	910	39,304	98.9	99.2
Ky-------	513	22,048	100.0	100.0	55	2,200	44	1,575	565	23,943	91.7	93.1
La-------	77	6,854	93.9	91.6	10	1,216	8	551	283	20,235	98.3	97.0
Maine----	395	17,853	100.0	100.0	61	3,369	99	3,758	494	21,611	99.8	99.8
Md-------	678	40,122	100.0	100.0	100	7,003	75	3,165	753	43,287	100.0	100.0
Mass-----	456	21,164	100.0	100.0	89	4,533	70	2,421	526	23,585	98.5	99.0
Mich-----	1,741	81,341	100.0	100.0	188	10,554	1,451	49,075	3,192	130,416	100.0	100.0
Minn-----	3,334	113,774	92.8	93.1	183	7,064	2,178	58,993	5,512	172,767	92.4	92.5
Miss-----	243	18,698	100.0	100.0	28	2,122	1	71	250	19,143	85.0	90.0
Mo-------	472	24,011	100.0	100.0	80	4,678	144	4,165	616	28,176	100.0	100.0
Mont-----	56	2,695	82.4	79.8	11	558	37	1,676	93	4,371	88.6	86.5
ebr-----	370	16,520	98.7	98.9	57	2,947	83	2,816	453	19,336	90.4	94.5
ev------	37	4,035	58.7	62.6	9	808	2	1,135	39	5,170	60.0	68.2
. H-----	258	12,332	100.0	100.0	58	2,881	39	1,450	304	14,150	93.5	94.9
. J-----	437	25,235	100.0	100.0	57	4,218	39	1,853	476	27,088	100.0	100.0
. Mex---	30	6,244	100.0	100.0	12	2,498	1	70	31	6,314	64.6	68.2
. Y-----	3,788	181,758	100.0	100.0	399	21,000	2,389	86,240	6,177	267,998	95.9	96.5
. C-----	759	47,669	100.0	100.0	90	7,108	37	1,479	865	52,481	100.0	100.0
. Dak---	153	5,599	98.7	91.8	17	687	27	625	201	6,752	91.8	90.1
hio-----	2,230	90,856	100.0	100.0	423	18,333	421	12,343	2,651	103,199	72.1	78.3
kla-----	231	14,163	100.0	100.0	49	2,922	46	2,357	277	16,520	98.6	99.3
reg-----	307	23,500	78.3	89.4	42	3,000	80	2,500	387	26,000	75.6	87.0
a-------	4,443	179,732	100.0	100.0	282	12,408	1,337	39,308	5,780	219,040	100.0	100.0
. R-----	7	893	100.0	100.0	--	-----	---	-----	7	893	20.0	16.7
. I-----	45	2,192	100.0	100.0	23	953	---	-----	45	2,192	100.0	100.0
. C-----	263	24,880	100.0	100.0	50	4,875	2	196	265	25,076	95.7	97.4
. Dak---	160	6,650	100.0	100.0	26	1,236	155	4,571	315	11,221	58.3	61.5
enn-----	509	30,429	100.0	100.0	65	4,673	7	226	523	30,942	93.9	97.1
ex------	315	27,872	95.5	95.9	67	5,092	18	1,116	337	29,206	94.1	94.8
tah-----	399	20,318	100.0	100.0	27	1,532	33	1,034	432	21,352	100.0	100.0
t-------	759	39,064	100.0	100.0	100	4,900	219	8,456	978	47,520	70.1	71.2
a-------	984	59,065	100.0	100.0	101	6,774	58	2,146	1,045	61,570	100.0	100.0
ash-----	540	37,060	100.0	100.0	101	6,523	36	1,189	576	38,249	100.0	100.0
Va----	165	8,189	93.2	93.2	19	1,152	21	778	246	10,441	94.6	94.3
s------	2,980	126,362	100.0	100.0	505	22,906	8,860	274,463	11,840	400,825	83.3	84.2
o------	31	1,428	100.0	100.0	5	210	25	1,122	56	2,550	100.0	100.0
Total or percent	35,628	1,784,519	94.5	85.0	4,445	245,446	19,981	630,166	56,150	2,442,534	87.6	82.0

Includes WADAM testing: Georgia, 27 herds, 3,475 cows; Illinois, 131 herds, 4,283 cows; Kentucky, 8 herds, 320 cows;
uisiana, 198 herds, 12,830 cows; Mississippi, 6 herds, 374 cows; New Hampshire, 7 herds, 368 cows; North Carolina, 69 herds,
333 cows; North Dakota, 21 herds, 528 cows; Tennessee, 7 herds, 287 cows; Texas, 4 herds, 218 cows; Virginia, 3 herds, 359
ws; West Virginia, 60 herds, 1,474 cows.
tal = 541 herds, 27,849 cows.
Percent of Standard DHIA and DHIR herds or cows enrolled in machine processing.

TABLE 6.--Status of Dairy Herd Improvement Association work in the United States
(1906-1967, inclusive)

Year	Associa- tions 1/	Super- visors 1/	Standard Plan							
						Average production				
			Herds	Cows	Cows per herd	Herds reported	Cows reported	Milk	Milk fat	Milk fat
	Number	Number	Number	Number	Number	Number	Number	Pounds	Percent	Pounds
1906---	1	-----	31	239	7.7	------	------	5,300	4.06	215
1907---	4	-----	------	1,606	----	------	------	5,366	4.10	220
1908---	6	-----	------	3,921	----	------	------	-----	----	---
1909---	25	-----	------	11,921	----	------	------	-----	----	---
1910---	40	-----	------	2/25,000	----	------	------	2/5,730	3.96	2/227
1911---	64	-----	------	2/40,000	----	------	------	-----	----	---
1912---	82	-----	------	2/43,000	----	------	------	-----	----	---
1913---	100	-----	------	47,150	----	------	------	-----	----	---
1914---	163	-----	------	73,280	----	------	------	-----	----	---
1915---	211	-----	------	105,526	----	------	------	-----	----	---
1916---	346	-----	------	150,677	----	------	------	-----	----	---
1917---	459	-----	11,720	216,831	18.5	------	------	-----	----	---
1918---	353	-----	9,778	172,518	17.6	------	------	-----	----	---
1919---	385	-----	10,000	167,313	16.7	------	------	-----	----	---
1920---	468	-----	11,948	203,472	17.0	------	------	6,175	4.00	247
1921---	452	-----	11,209	193,928	17.3	------	------	-----	----	---
1922---	513	-----	12,508	215,321	17.2	------	------	-----	----	---
1923---	627	-----	16,357	277,010	16.9	------	------	-----	----	---
1924 3/	---	-----	-------	-------	----	------	------	-----	----	---
1925---	732	-----	18,677	307,073	16.4	------	42,302	7,189	3.95	284
1926---	777	-----	19,540	327,653	16.8	------	103,443	7,331	3.96	290
1927---	837	-----	21,128	362,014	17.1	------	116,509	7,411	3.95	293
1928---	947	-----	23,327	414,891	17.8	------	152,412	7,476	3.96	296
1929---	1,090	-----	26,182	465,804	17.8	------	194,859	7,498	3.97	298
1930---	1,143	-----	27,888	507,549	18.2	------	235,624	7,642	3.96	303
1931---	1,112	-----	26,308	510,714	19.4	------	219,924	7,812	3.92	306
1932---	1,005	-----	20,351	427,044	21.0	------	186,683	7,858	3.95	310
1933---	881	-----	15,447	358,501	23.2	------	163,014	7,849	3.99	313
1934---	793	-----	13,694	325,837	23.8	------	203,930	8,015	4.02	322
1935---	809	-----	15,573	364,218	23.4	------	200,367	7,977	4.04	322
1936---	876	-----	17,344	404,412	23.3	------	257,248	7,912	4.03	319
1937---	992	-----	20,772	496,562	23.9	------	354,568	7,923	4.04	320
1938---	1,106	-----	23,701	558,993	23.6	------	448,025	7,831	4.05	317
1939---	1,228	-----	25,949	625,284	24.1	------	507,563	7,977	4.05	323
1940---	1,300	-----	27,948	676,141	24.2	------	545,382	8,133	4.07	331
1941---	1,383	-----	31,381	763,502	24.3	------	591,103	8,225	4.07	335
1942---	1,421	-----	32,957	816,117	24.8	------	514,758	8,323	4.07	339
1943---	1,057	-----	24,155	616,972	25.5	------	375,914	8,325	4.06	338
1944---	954	-----	20,825	561,587	27.0	------	383,337	8,296	4.05	336
1945---	949	-----	21,254	577,200	27.2	------	384,360	8,592	4.03	346
1946---	1,124	-----	23,331	627,878	27.0	------	413,554	8,635	4.04	349
1947---	1,426	-----	28,812	775,546	26.9	------	533,061	8,638	4.03	348
1948---	1,668	-----	33,274	886,129	26.6	------	620,385	8,675	4.03	350
1949---	1,787	-----	35,851	943,939	26.3	------	729,150	8,907	4.03	359
1950---	1,973	-----	40,100	1,088,872	27.2	------	836,922	9,172	4.03	370
1951---	2,143	-----	42,949	1,186,615	27.6	------	885,859	9,195	4.02	370
1952---	2,109	-----	40,105	1,166,297	29.1	------	928,376	9,192	3.98	366
1953---	2,151	-----	40,983	1,226,588	29.9	------	1,020,326	9,253	3.98	368
1954---	2,175	-----	41,254	1,311,698	31.8	------	1,079,557	9,363	3.97	372
1955---	2,288	-----	41,240	1,333,866	32.3	------	1,175,378	9,502	3.95	375
1956---	2,266	-----	40,984	1,406,306	34.4	------	1,229,971	9,713	3.94	383
1957 4/	1,700	2,310	41,638	1,479,799	35.5	------	1,256,129	9,894	3.93	389
1958---	1,544	2,293	39,985	1,548,884	38.7	------	1,345,750	10,068	3.91	394
1959---	1,500	2,337	40,284	1,607,538	39.9	------	1,406,665	10,327	3.88	401
1960---	1,509	2,397	41,293	1,746,752	42.3	------	5/1,343,725	5/10,561	3.87	5/409
1961---	1,395	2,448	42,558	1,867,469	43.9	28,649	1,280,785	10,796	3.87	418
1962---	1,436	2,472	42,034	1,958,355	46.6	32,794	1,531,826	11,032	3.86	426
1963---	1,441	2,516	41,937	2,006,534	47.8	35,378	1,674,803	11,286	3.85	434
1964---	1,420	2,474	40,670	2,010,144	49.4	35,689	1,746,475	11,685	3.83	447
1965---	1,424	2,439	40,075	2,087,581	52.1	35,604	1,821,252	11,976	3.82	457
1966---	1,418	2,378	38,879	2,058,592	52.9	34,886	1,852,533	12,127	3.81	462
1967---	1,344	2,319	37,683	2,098,919	55.7	------	---------	------	----	---

1/ Number of associations and supervisors include all plans.
2/ Estimated.
3/ Date for collecting data changed in 1924 from July 1 to January 1.
4/ Prior to 1957 associations were counted on the basis of supervisor circuits.
5/ National testing year changed in 1960 to begin May 1. These values are averages of 1959 and 1961.

TABLE 7.--Ten-year production summary: U.S. cows and DHIA cows (1957-1966)

Year 1/	U.S. report for all milk cows 2/					Standard DHIA Plan			
	Milk cows	Milk produced	Production/cow			Cows	Production/cow		
			Milk	Milk fat	Milk fat		Milk	Milk fat	Milk fat
	Thousands	Mil. lb.	Pounds	Percent	Pounds	Number	Pounds	Percent	Pounds
1957---------	19,774	124,628	6,303	3.81	240	1,548,884	9,894	3.93	389
1958---------	18,711	123,220	6,585	3.78	249	1,607,538	10,068	3.91	394
1959---------	17,901	121,989	6,815	3.76	256	1,746,752	10,327	3.88	401
1960---------	17,515	123,109	7,029	3.76	264	1,867,469	3/10,561	3.87	3/409
1961---------	17,243	125,707	7,290	3.74	273	1,958,355	10,796	3.87	418
1962---------	16,842	126,251	7,496	3.74	280	2,006,534	11,032	3.86	426
1963---------	16,260	125,202	7,770	3.71	286	2,010,144	11,286	3.85	434
1964---------	15,677	126,967	8,099	3.70	300	2,087,581	11,685	3.83	447
1965---------	14,954	124,173	8,304	3.71	308	2,058,592	11,976	3.82	457
1966---------	4/14,123	4/120,230	4/8,513	3.70	4/315	2,098,919	12,127	3.81	462

1/ Based on succeeding January 1 reports of cows on test in the National Cooperative Dairy Herd Improvement Program.
2/ Revised estimates of number of milk cows and milk production for 1960-65 as reported by the Statistical Reporting Service (USDA), in"Milk Production and Dairy Products, Annual Statistical Summary 1966,"February 1967.
3/ National testing year changed in 1960 to begin May 1. These values are averages of 1959 and 1961.
4/ Statistical Reporting Service (USDA),"Milk Production and Dairy Products, Annual Statistical Summary 1966," February 1967. Data are preliminary.

TABLE 8.--Eleven-year summary of the National Cooperative Dairy Herd Improvement Program: U.S. cows and DHIA cows (1956-1966)

Year 1/	Standard Plan		Owner-Sampler Plan		Weigh-a-Day-a-Month Plan		Milk cows in U. S.	
	Cows on test	Proportion of U.S. cows	Cows on test	Proportion of U.S. cows	Cows on test	Proportion of U.S. cows	Cows 2/	Proportion of U.S. cows
	Number	Percent	Number	Percent	Number	Percent	Thousands	Percent
1956--------	1,479,799	7.22	405,090	1.98	21,297	0.10	20,501	9.3
1957--------	1,548,884	7.83	490,001	2.48	79,489	.40	19,774	10.7
1958--------	1,607,538	8.59	549,916	2.94	74,814	.40	18,711	11.9
1959--------	1,746,752	9.76	615,899	3.44	76,392	.43	17,901	13.6
1960--------	1,867,469	10.66	655,885	3.74	70,847	.40	17,515	14.8
1961--------	1,958,355	11.36	698,302	4.05	70,617	.41	17,243	15.8
1962--------	2,006,534	11.91	726,478	4.31	50,492	.30	16,842	16.5
1963--------	2,010,144	12.36	752,229	4.63	60,149	.37	16,260	17.4
1964--------	2,087,581	13.32	818,406	5.22	56,570	.36	15,677	18.9
1965--------	2,058,592	13.77	839,838	5.62	56,957	.38	14,954	19.8
1966--------	2,098,919	14.86	825,127	5.84	53,429	.38	14,123	21.1

1/ Based on succeeding January 1 reports of cows on test in the National Cooperative Dairy Herd Improvement Program.
2/ Average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA). See footnote 1, table 7.

TABLE 9.--Counties, by State, with 40 percent or more cows included in the National Cooperative Dairy Herd Improvement Program--January 1, 1967

State and county	Cows enrolled in DHIA plans
	Percent
ALABAMA	
Talladega	41
Ellmore	40
12% of the counties have 25% or more of their cows on test.	
ARIZONA	
Pima	100
Pinal	77
Cochise	65
Maricopa	62
Graham	56
36% of the counties have 25% or more of their cows on test.	
CALIFORNIA	
Contra Costa	98
Kern	84
Monterey	82
Tehama	71
Marin	70
San Diego	70
Santa Barbara	69
Madera	68
Ventura	68
Fresno	62
Placer	62
San Joaquin	60
Sonoma	60
Tulare	54
Stanislaus	52
Riverside	51
Sacramento	51
San Luis Obispo	50
San Benito	49
Merced	46
Del Norte	44
Santa Clara	44
Napa	42
Sutter	42
Kings	40
San Bernardino	40
57% of the counties have 25% or more of their cows on test.	
COLORADO	
Chaffee	63
Mesa	52
11% of the counties have 25% or more of their cows on test.	
CONNECTICUT	
Hartford	45
Litchfield	45
Windham	44
Tolland	42
New Haven	40
88% of the counties have 25% or more of their cows on test.	
DELAWARE	
33% of the counties have 25% or more of their cows on test.	
FLORIDA	
Orange	70
Manatee	66
Gilchrist	65
Osceola	62
Washington	62
Union	57
Jackson	54
Putnam	53
Alachua	52
Seminole	45
Madison	44
Lake	43
Jefferson	42
25% of the counties have 25% or more of their cows on test.	
GEORGIA	
Douglas	95
Echols	95
Houston	78
Macon	75
Jeff Davis	74
Mitchell	72
Peach	72
Clarke	63
Clayton	62
Dooly	62
Newton	62
Fayette	50
Walton	49
Coffee	48
Schley	47
Tattnall	47
Jones	45
De Kalb	44
Butts	43
Dougherty	43
McDuffie	43
Jefferson	41
Rockdale	41
Thomas	41
Carroll	40
25% of the counties have 25% or more of their cows on test.	
HAWAII	
20% of the counties have 25% or more of their cows on test.	
ILLINOIS	
Champaign	42
Lawrence	41
Moultrie	40
19% of the counties have 25% or more of their cows on test.	
INDIANA	
Hancock	44
Boone	41
7% of the counties have 25% or more of their cows on test.	
IOWA	
Dallas	41
11% of the counties have 25% or more of their cows on test.	
KANSAS	
Comanche	49
Saline	49
Finney	41
13% of the counties have 25% or more of their cows on test.	
LOUISIANA	
West Carroll	63
Morehouse	52
Franklin	49
Iberia	40
17% of the counties have 25% or more of their cows on test.	
MAINE	
Oxford	45
44% of the counties have 25% or more of their cows on test.	
MARYLAND	
Dorchester	46
Allegany	45
43% of the counties have 25% or more of their cows on test.	
MASSACHUSETTS	
Berkshire	41
50% of the counties have 25% or more of their cows on test.	
MICHIGAN	
Barry	46
Ingham	44
Jackson	43
Calhoun	41
Kalamazoo	41
33% of the counties have 25% or more of their cows on test.	
MINNESOTA	
9% of the counties have 25% or more of their cows on test.	
MISSISSIPPI	
Washington	62
4% of the counties have 25% or more of their cows on test.	
MISSOURI	
2% of the counties have 25% or more of their cows on test.	
MONTANA	
2% of the counties have 25% or more of their cows on test.	
NEBRASKA	
4% of the counties have 25% or more of their cows on test.	
NEVADA	
Clark	100
Lincoln	100
Churchill	48
24% of the counties have 25% or more of their cows on test.	
NEW HAMPSHIRE	
Sullivan	42
Merrimack	40
90% of the counties have 25% or more of their cows on test.	
NEW JERSEY	
33% of the counties have 25% or more of their cows on test.	
NEW MEXICO	
Dona Ana	72
Sierra	64
16% of the counties have 25% or more of their cows on test.	
NEW YORK	
Dutchess	50
Columbia	45
Suffolk	45
Tompkins	45
Ontario	40
46% of the counties have 25% or more of their cows on test.	
NORTH CAROLINA	
Carteret	100
Lee	100
Swain	100
Hyde	88
Columbus	86
Harnett	84
Perquimans	77
Pitt	72

TABLE 9.--Counties, by State, with 40 percent or more cows included in the National Cooperative Dairy Herd Improvement Program--January 1, 1967--Continued

State and county	Cows enrolled in DHIA plans
	Percent
NORTH CAROLINA (contd.)	
Macon	66
Duplin	65
Durham	65
Pender	64
Nash	63
Wake	63
Person	62
Beaufort	61
Brunswick	61
Onslow	61
Orange	59
Lenoir	58
Moore	57
Jones	55
Guilford	54
Gaston	53
Wayne	53
Caswell	52
Franklin	52
New Hanover	52
Bertie	50
Warren	50
Washington	50
Bladen	49
Craven	47
Granville	45
Madison	45
Wilson	45
Montgomery	44
Robeson	43
Scotland	43
Edgecombe	42
Hoke	42
Pamlico	41
Catawba	40
Chatham	40
66% of the counties have 25% or more of their cows on test.	
OHIO	
Marion	47
Erie	41
Auglaize	41
Clark	40
44% of the counties have 25% or more of their cows on test.	
OKLAHOMA	
4% of the counties have 25% or more of their cows on test.	
OREGON	
Klamath	40
28% of the counties have 25% or more of their cows on test	
PENNSYLVANIA	
Montgomery	50
Blair	48
Union	43
Mifflin	42
Clinton	41
Dauphin	41
Bucks	40
Huntingdon	40
Juniata	40
Northumberland	40
60% of the counties have 25% or more of their cows on test.	
RHODE ISLAND	
40% of the counties have 25% or more of their cows on test.	
SOUTH CAROLINA	
Bamberg	63
Orangeburg	60
Sumter	59
Calhoun	54
Colleton	54
Kershaw	54
Hampton	51
SOUTH CAROLINA (contd.)	
Newberry	48
Lee	45
Saluda	44
Barnwell	42
Beaufort	41
Marlboro	41
39% of the counties have 25% or more of their cows on test.	
SOUTH DAKOTA	
4% of the counties have 25% or more of their cows on test.	
TENNESSEE	
Dyer	85
5% of the counties have 25% or more of their cows on test.	
TEXAS	
Deaf Smith	75
Goliad	75
Hutchinson	75
San Patricio	75
Starr	75
Milam	65
Willacy	63
Burleson	62
Scurry	45
7% of the counties have 25% or more of their cows on test.	
UTAH	
Salt Lake	53
Wasatch	52
Summit	44
Washington	43
45% of the counties have 25% or more of their cows on test.	
VERMONT	
Washington	46
Bennington	45
Addison	44
Windsor	44
71% of the counties have 25% or more of their cows on test.	
VIRGINIA	
City of Hampton	100
City of Newport News	100
James City	87
Lancaster	62
Northampton	60
Bath	53
Isle of Wight	51
Roanoke	50
Culpeper	48
Prince George	48
Henrico	47
Orange	44
Pulaski	44
Dinwiddie	43
City of Chesapeake	42
Loudoun	42
Charlotte	40
44% of the counties have 25% or more of their cows on test.	
WASHINGTON	
23% of the counties have 25% or more of their cows on test.	
WEST VIRGINIA	
6% of the counties have 25% or more of their cows on test.	
WISCONSIN	
Kenosha	41
Winnebago	40
29% of the counties have 25% or more of their cows on test.	

TABLE 10.--Production records reported to the USDA for quarterly evaluations in 1966 1/

State	DHIA cows on test 1-1-66	1966 production records					1965 production records	
		Hand recorded (718 cards)	Punched (1095 cards) 2/	Magnetic tape	Total			
	Number	Number	Number	Number	Number	Percent 3/	Number	Percent 3/
Ala--------	28,917	---	25,955	---	25,955	89.8	25,742	97.1
Alaska-----	196	---	---	188	188	95.9	225	58.4
Ariz-------	15,956	---	4,745	---	4,745	29.7	3,631	18.0
Ark--------	3,437	---	40	3,515	3,555	103.4	4,061	129.0
Calif------	346,141	1,905	72,215	---	74,120	21.4	59,570	17.0
Colo-------	15,526	---	8,011	---	8,011	51.6	5,569	38.6
Conn-------	22,664	7	76	27,257	27,340	120.6	23,016	101.5
Del--------	4,744	---	70	5,988	6,058	127.7	4,675	110.4
Fla--------	19,018	386	16,860	---	17,246	90.7	13,914	76.9
Ga---------	29,550	28	26,975	---	27,003	91.4	25,589	89.8
Hawaii-----	2,300	---	---	873	873	38.0	333	16.9
Idaho------	24,983	503	1,506	18,632	20,641	82.6	13,602	50.2
Ill--------	61,102	50	57,815	---	57,865	94.7	57,122	88.9
Ind--------	46,228	---	28,240	16,992	45,232	97.8	55,577	128.1
Iowa-------	59,640	68	15	62,632	62,715	105.2	65,306	105.8
Kans-------	33,751	112	13	36,016	36,141	107.1	35,106	110.9
Ky---------	22,000	37	20,083	---	20,120	91.5	19,879	95.0
La---------	5,929	147	4,571	---	4,718	79.6	4,223	86.5
Maine------	18,108	36	17	22,917	22,970	126.9	19,155	96.0
Md---------	44,896	487	40,853	65	41,405	92.2	37,419	85.1
Mass-------	20,768	306	82	26,283	26,671	128.4	22,677	102.3
Mich-------	85,234	---	79,607	---	79,607	93.4	114,115	125.8
Minn-------	124,103	---	119,501	---	119,501	96.3	104,451	82.6
Miss-------	17,237	1	15,067	---	15,068	87.4	13,069	97.5
Mo---------	19,472	55	176	21,604	21,835	112.1	18,836	75.0
Mont-------	3,483	---	2,182	---	2,182	62.6	1,945	49.3
Nebr-------	15,484	3	43	15,469	15,515	100.2	15,085	104.8
Nev--------	4,126	---	2,402	---	2,402	58.2	1,915	49.8
N. H-------	12,615	---	41	16,131	16,172	128.2	13,048	110.0
N. J-------	25,273	181	489	32,866	33,536	132.7	25,251	83.8
N. Mex-----	3,794	---	3,455	---	3,455	91.1	2,325	54.3
N. Y-------	179,851	---	3	240,590	240,593	133.8	186,596	107.6
N. C-------	46,501	---	43,628	---	43,628	93.8	46,185	104.3
N. Dak-----	5,529	136	---	5,802	5,938	107.4	6,604	110.0
Ohio-------	94,135	---	62,067	33,281	95,348	101.3	111,063	124.0
Okla-------	12,866	---	1	12,614	12,615	98.0	11,472	102.0
Oreg-------	25,910	---	135	17,585	17,720	68.4	16,054	59.0
Pa---------	175,563	---	650	168,864	169,514	96.6	211,128	120.4
P. R-------	4,575	---	---	---	---	---	---	---
R. I-------	2,445	---	16	2,947	2,963	121.2	2,169	95.3
S. C-------	22,376	---	21,235	---	21,235	94.9	21,646	101.4
S. Dak-----	6,742	---	---	6,806	6,806	100.9	7,553	112.0
Tenn-------	28,654	---	26,136	---	26,136	91.2	24,810	92.5
Tex--------	28,120	92	24,718	---	24,810	88.2	23,319	84.0
Utah-------	20,991	---	20,059	---	20,059	95.6	15,099	79.2
Vt---------	47,023	3,156	21	45,382	48,559	103.3	36,087	75.6
Va---------	57,649	1,825	58,719	---	60,544	105.0	59,065	96.5
Wash-------	26,345	---	---	30,130	30,130	114.4	30,285	55.2
W. Va------	6,613	57	---	8,707	8,764	132.5	5,489	88.7
Wis--------	128,895	---	99	110,358	110,457	85.7	128,388	102.3
Wyo--------	1,134	---	310	---	310	27.3	309	26.2
U. S.------	2,058,592	9,578	788,902	990,494	1,788,974	86.9	1,749,752	83.8

1/ Includes only records reported in time for use in the quarterly sire evaluations in 1966.

2/ Includes lactation records from the American Guernsey Cattle Club.

3/ Records are expressed as percent of cows enrolled in DHIA. Percentages vary by State and may exceed 100 percent depending upon reporting and processing procedures in December and January of each year and year to year changes in reporting procedures.

TABLE 11.--Lactation records received by USDA for selective years

Year	Standard DHIA cows enrolled on January 1 of each year	Lactation records reported to USDA	Standard DHIA cows represented by records reported
	Number	Number	Percent
1956	1,406,306	658,086	47
1960	1,746,752	886,495	51
1964	2,010,144	1,437,959	72
1965	2,087,581	1,749,752	84
1966	2,058,592	1,788,974	87

TABLE 12.--Relative frequency of Standard DHIA lactation record rejects in 1966, listed on Form 1060

Reject code	Type of reject	Total records rejected	Percent of all rejects	Percent of all records 1/
D	Birth date---------------------	35,071	19.9	1.9
H	Identification of parents------	25,650	14.6	1.4
F	Possible twin------------------	25,319	14.4	1.4
B	Dam number, registered---------	18,027	10.2	1.0
A	Sire number, registered--------	16,552	9.4	.9
Q	Calving date-------------------	14,783	8.4	.8
M	Eartag identification----------	3,074	1.7	.2
R	Unusual percent test-----------	2,140	1.2	.1
I	Cow number, registered	1,534	.9	.1
C	Cow, sire, or dam registration-number, blank or alphabetic.	1,485	.8	.1
J	Same identification number,----cow, sire, or dam.	502	.3	(2/)
W	Identification conflict with---breed association data.	221	.1	(2/)
V	Days in milk, 3X exceeds 2X----	210	.1	(2/)
G	Herd code number---------------	172	.1	(2/)
T	Production---------------------	172	.1	(2/)
E	Breed--------------------------	107	.1	(2/)
P	Production, blank, or ---------alphabetic in milk and fat field.	34	(2/)	(2/)
	Pre-edit rejects 3/-------------------	30,985	17.6	1.7
	Total or percent--------------------	176,038	100.0	9.6

1/ 1,788,974 incoming records plus 57,316 records re-entered after correction by DHIA = 1,846,290.

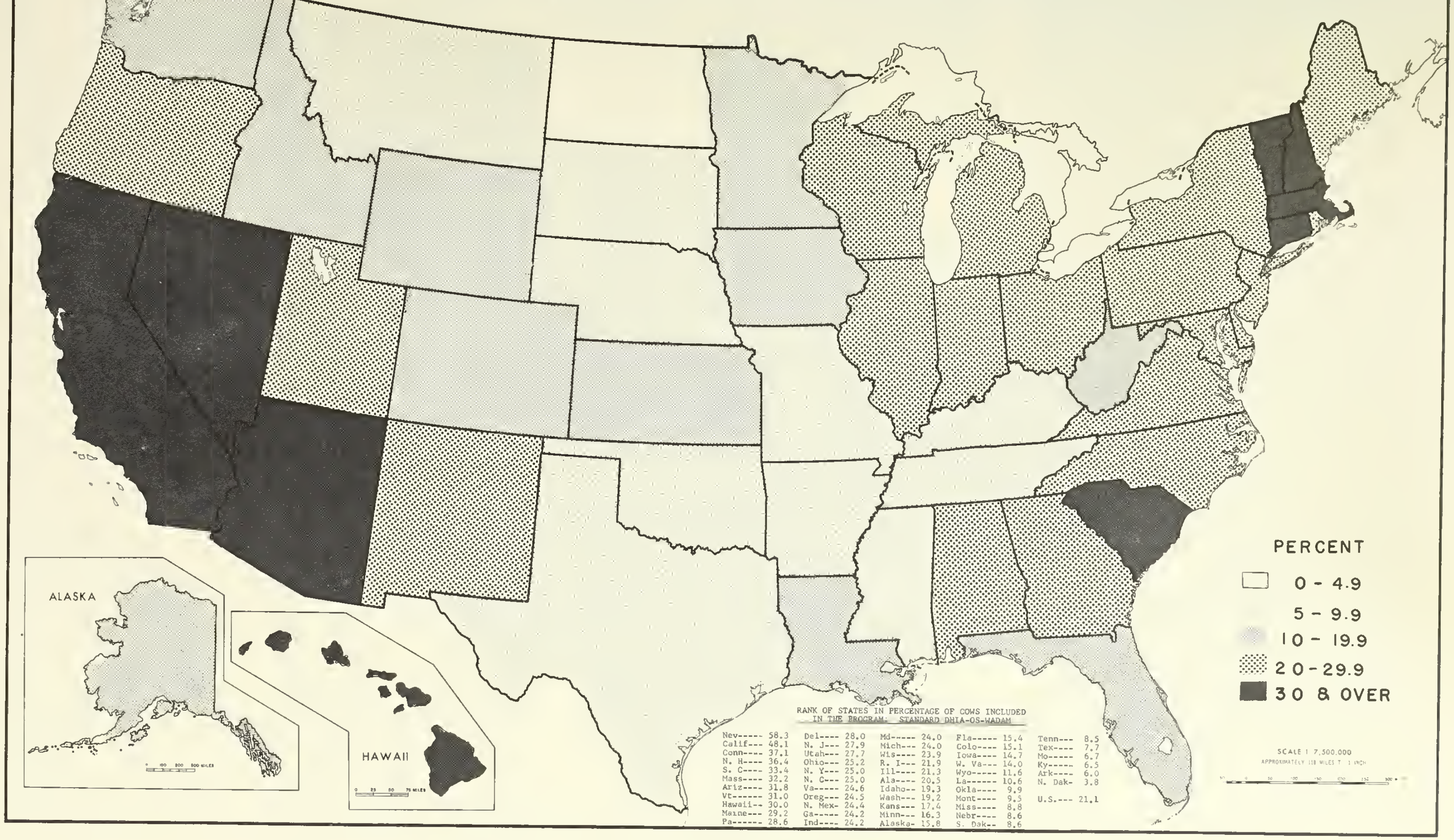
2/ Less than 0.05 percent.

3/ Major types of pre-edit rejects involve alphabetics, blanks, or zeros in cow, sire, or dam numbers of registered cows; alphabetics, blanks, or zeros in birth dates; unequal breeds for registered cows and their sires, or dams; cows with zero breeds and registered cows with breed 8; unequal breeds for eartag cows and their sires; alphabetics or blanks in the lactation records; records beginning with an abortion; estimated records; and nurse cow records.

TABLE 13.--Number of bulls summarized in 1966 with one or more daughters in individual States, by breed

State	Ayrshire	Guernsey	Holstein	Jersey	Brown Swiss	Shorthorn	Red Dane	Other	Red Poll	Total
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
Maine	54	113	455	115	28	3	--	--	--	768
New Hampshire	95	88	478	137	45	8	--	--	--	851
Vermont	116	153	900	292	77	2	--	--	--	1,540
Massachusetts	113	161	733	172	58	5	--	--	--	1,242
Rhode Island	70	74	249	23	--	--	--	--	--	416
Connecticut	86	258	712	89	53	--	--	--	--	1,198
New York	179	362	2,301	342	132	5	4	--	--	3,325
New Jersey	13	216	707	98	109	--	--	--	--	1,143
Pennsylvania	181	657	2,051	247	119	19	--	1	--	3,275
Ohio	109	396	1,196	374	179	21	--	--	--	2,275
Indiana	56	384	922	185	121	39	10	--	2	1,719
Illinois	89	330	1,119	165	150	22	--	--	--	1,875
Michigan	56	238	1,290	169	106	18	14	--	--	1,891
Wisconsin	55	493	1,965	180	181	36	--	--	2	2,912
Minnesota	102	260	1,391	178	132	42	--	--	--	2,105
Iowa	109	227	1,274	205	192	54	--	--	--	2,061
Missouri	--	163	641	137	34	28	--	--	--	1,003
North Dakota	1	33	315	7	41	6	--	--	--	403
South Dakota	51	24	414	26	45	--	--	--	--	560
Nebraska	16	126	493	72	78	26	--	--	--	811
Kansas	79	138	702	109	101	13	--	--	--	1,142
Delaware	31	58	281	32	17	--	--	--	--	419
Maryland	69	235	894	104	91	7	--	--	--	1,400
Virginia	68	294	870	104	98	--	--	--	--	1,434
West Virginia	49	51	392	63	4	--	--	--	--	559
North Carolina	40	242	675	216	50	--	--	--	--	1,223
South Carolina	11	288	357	223	62	1	--	--	--	942
Georgia	53	134	478	185	87	--	--	--	--	937
Florida	33	244	301	188	73	--	--	--	--	839
Kentucky	23	115	621	137	58	--	--	--	--	954
Tennessee	76	228	446	222	93	8	--	--	--	1,073
Alabama	33	93	293	157	53	--	--	--	--	629
Mississippi	59	168	222	180	39	--	--	--	--	668
Arkansas	9	59	261	46	12	14	--	--	--	401
Louisiana	3	172	158	69	22	--	--	--	--	424
Oklahoma	45	107	388	78	22	29	--	--	--	669
Texas	28	106	534	239	59	2	--	--	--	968
Montana	6	22	153	29	21	--	--	--	--	231
Idaho	22	129	473	107	33	3	--	--	--	767
Wyoming	--	17	71	--	--	--	--	--	--	88
Colorado	14	136	414	42	42	5	--	--	--	653
New Mexico	--	61	198	44	--	--	--	--	--	303
Arizona	--	87	332	23	9	--	--	--	--	451
Utah	16	70	431	81	6	--	--	--	--	604
Nevada	--	--	84	59	6	--	--	--	--	149
Washington	44	192	441	121	27	5	--	--	--	830
Oregon	12	141	268	157	31	4	--	--	--	613
California	46	131	981	201	63	--	--	--	--	1,422
Puerto Rico	--	--	25	--	--	--	--	--	--	25
Hawaii	--	--	26	--	--	--	--	--	--	26
Alaska	--	--	14	--	39	--	--	--	--	53
Total sire records sent to States	--	--	--	--	--	--	--	--	--	52,269
Total number of individual sires summarized	643	2,989	10,433	2,264	696	195	14	1	4	17,239

NATIONAL COOPERATIVE DAIRY HERD IMPROVEMENT PROGRAM
PERCENTAGE OF COWS IN PROGRAM JANUARY 1, 1967



RANK OF STATES IN PERCENTAGE OF COWS INCLUDED IN THE PROGRAM: STANDARD DHIA-OS-WADAM

Nev-----	58.3	Del----	28.0	Md-----	24.0	Fla-----	15.4	Tenn---	8.5
Calif---	48.1	N. J---	27.9	Mich---	24.0	Colo----	15.1	Tex----	7.7
Conn----	37.1	Utah---	27.7	Wis----	23.9	Iowa----	14.7	Mo-----	6.7
N. H----	36.4	Ohio---	25.2	R. I---	21.9	W. Va---	14.0	Ky-----	6.5
S. C----	33.4	N. Y---	25.0	Ill----	21.3	Wyo-----	11.6	Ark----	6.0
Mass----	32.2	N. C---	25.0	Ala----	20.5	La------	10.6	N. Dak-	3.8
Ariz----	31.8	Va-----	24.6	Idaho--	19.3	Okla----	9.9		
Vt------	31.0	Oreg---	24.5	Wash---	19.2	Mont----	9.5	U.S.---	21.1
Hawaii--	30.0	N. Mex-	24.4	Kans---	17.4	Miss----	8.8		
Maine---	29.2	Ga-----	24.2	Minn---	16.3	Nebr----	8.6		
Pa------	28.6	Ind----	24.2	Alaska-	15.8	S. Dak--	8.6		

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AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

Dairy-Herd-Improvement Letter
ARS-44-191
(Vol. 43, No. 3)

April 1967

ARTIFICIAL INSEMINATION (AI) PARTICIPATION REPORT FOR THE UNITED STATES 1966 1/

An estimated total of 7,933,723 cows were bred artificially in the United States in 1966. Of these, 7,286,580 were dairy cows, and 647,143 were beef cows. Semen from dairy bulls was used to inseminate 6,413,453 dairy cows . Semen from beef bulls was used to inseminate 873,127 dairy cows in addition to the beef animals. These dairy animals bred to beef bulls represented 12.0 percent of the 7,250,000 dairy cattle bred artificially.

Because of incomplete reporting and the lack of information, the tabular data in this report are partly estimations. Where possible, estimates were based on the averages and percentages from complete reports. Where only the number of ampules of semen used were available, the number of first services were estimated to be one-half of the number of ampules reported.

Table 1 shows that 47.9 percent of the nation's 15,201,000 dairy cows and heifers were artificially inseminated in 1966. About 1.9 percent of the nation's beef cows and heifers were artificially inseminated in the same period. Approximately 11 percent, or 818,630, of the dairy cattle so bred were registered.

1/ Prepared by C. A. Rampendahl, R. D. Plowman, and B. T. McDaniel from data supplied by artificial insemination organizations, State Extension Dairymen, and the National Association of Animal Breeders.

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Issued June 1967

The top 10 States in number and percentage of dairy and beef cattle bred artificially are shown in table 2. Wisconsin had the highest number of dairy cows, and Kansas the highest number of beef cattle.

A comparison of the scope of artificial insemination by State for the years 1965 and 1966 is shown in table 3. The greatest increase in the number of dairy cows bred occurred in Florida, and Kansas had the greatest advance in beef cattle.

The number of cows bred artificially in the United States since 1939 is shown by year in table 4. The continual upward trend in the percentage of dairy cattle bred artificially is illustrated in figure 1.

Table 5 shows that 35 organizations bred cows artificially in 1966. These organizations serviced an estimated 540,265 herds. However, it should be noted that a herd would be counted more than once when two or more AI studs bred cows in the same herd. It is estimated that 103,295 cows were bred by semen sold to individual farmers by the studs, and that 77,076 cows were bred by semen custom-frozen in addition to the 7,753,352 cattle serviced directly by their technicians.

Two organizations reported that they artificially inseminated 5,267 swine, which is 1,698 or 47.6 percent more than in 1965. Services to only 97 goats were indicated, a drop of 82 percent from 1965.

A total of 2,376 bulls were in AI studs in 1966. This probably exceeds the number of bulls actually in service in 1966, because it includes all bulls reported in studs at any time in 1966. It was possible to remove bulls without services from the counts only in cases where the stud reported an actual or estimated number of services by each individual bull.

The distribution of the 2,012 dairy bulls by type of service and breed is shown in table 6. About 59 percent of the dairy bulls were available in regular service, 35 percent were involved in progeny testing only, and the remaining 5 percent were available only on a special service basis. Only 1,737 of the dairy bulls were reported as having semen available on January 1, 1967. All 364 of the beef bulls were reported as in regular service.

Table 7 lists artificial breeding organizations active in 1966.

The accompanying map illustrates the AI density in the United States in 1966.

TABLE 1.--Status of artificial breeding in the United States, January 1, 1967

State and other sources	Studs 1/	Bred to dairy sires in 1966		Bred to beef sires in 1966		Dairy cattle		Beef cattle	
		Registered dairy cows 2/	Total dairy cows	Dairy cows	Beef cows	All U.S. milk cows 3/	Dairy cows bred as a percentage of all milk cows 4/	Other U.S. cattle and calves 2 years and older 5/	Beef cows bred as a percentage of other cattle and calves 6/
	Number	Number	Number	Number	Number	Thousands	Percent	Thousands	Percent
Alabama----------	0	4,729	44,803	2,451	2,189	177	26.7	830	0.3
Alaska-----------	1	136	783	-----	-----	2.1	37.3	2.3	---
Arizona----------	0	1,930	17,095	1,941	6,863	56	34.0	380	1.8
Arkansas---------	0	3,063	25,481	2,151	3,614	125	22.1	820	.4
California-------	4	21,145	356,453	33,272	15,153	841	46.3	1,025	1.5
Colorado---------	1	3,632	32,940	2,288	5,747	107	32.9	981	.6
Connecticut------	0	7,013	43,996	5,503	596	77	64.3	4	14.9
Delaware---------	0	2,115	7,303	1,382	150	18	48.3	3	5.0
Florida----------	0	11,344	116,143	18,989	11,783	189	71.5	900	1.3
Georgia----------	0	7,097	52,688	5,363	4,474	163	35.6	754	.6
Hawaii-----------	0	307	6,939	323	1,312	16	45.4	87	1.5
Idaho------------	0	5,149	68,169	9,242	6,825	171	45.3	513	1.3
Illinois---------	1	31,087	183,008	27,668	22,465	419	50.3	749	3.0
Indiana----------	1	15,112	118,929	13,095	13,555	323	40.9	418	3.2
Iowa-------------	0	10,897	135,520	25,817	29,350	707	22.8	1,354	2.2
Kansas-----------	1	9,452	81,183	6,870	44,298	245	35.9	1,627	2.7
Kentucky---------	0	16,444	108,008	21,846	15,899	430	30.2	885	1.8
Louisiana--------	1	6,388	60,567	9,471	10,987	215	32.6	910	1.2
Maine------------	0	7,022	43,836	5,349	92	77	63.9	9	1.0
Maryland---------	1	11,817	75,975	9,854	2,306	190	45.2	52	4.4
Massachusetts-----	0	7,403	43,444	7,146	823	78	64.9	4	20.6
Michigan---------	1	48,845	283,026	34,143	8,280	565	56.1	124	6.7
Minnesota--------	2	36,201	555,767	71,652	12,046	1,230	51.0	457	2.6
Mississippi------	1	6,928	44,622	7,345	5,023	261	19.9	1,153	.4
Missouri---------	0	17,989	115,273	26,713	18,771	452	31.4	1,699	1.1
Montana----------	0	1,365	12,487	1,153	33,966	55	24.8	1,466	2.3
Nebraska---------	0	4,509	40,392	6,441	22,117	246	19.0	1,864	1.2
Nevada-----------	0	378	3,791	298	1,444	15	27.3	286	.5
New Hampshire-----	0	3,667	23,656	2,918	116	45	59.1	2	5.8
New Jersey--------	0	12,704	51,000	7,461	447	103	56.8	6	7.5
New Mexico--------	0	1,787	24,341	1,342	1,182	41	62.6	696	.2
New York---------	1	100,636	644,253	82,274	3,347	1,196	60.7	50	6.7
North Carolina----	1	13,421	82,030	8,827	7,918	225	40.4	303	2.6
North Dakota------	0	1,052	23,900	2,643	15,053	206	12.9	976	1.5
Ohio-------------	2	51,513	265,058	43,025	22,295	557	55.3	313	7.1
Oklahoma---------	0	10,223	22,437	1,501	7,564	173	13.8	1,942	.4
Oregon-----------	0	5,667	61,462	5,090	5,736	132	50.4	666	.9
Pennsylvania------	3	120,727	481,502	77,058	10,499	848	65.9	102	10.3
Puerto Rico-------	1	3,881	49,235	1,477	------	-----	----	-----	----
Rhode Island------	0	620	3,807	605	3	10	44.1	1	.3
South Carolina----	0	3,925	30,152	3,030	3,822	83	40.0	237	1.6
South Dakota------	0	2,761	30,233	2,857	10,200	229	14.4	1,642	.6
Tennessee--------	3	13,507	84,708	12,635	19,420	395	24.6	865	2.2
Texas------------	0	10,868	97,715	7,035	29,697	419	25.0	5,251	.6
Utah-------------	1	3,387	47,152	5,637	4,126	83	63.6	310	1.3
Vermont----------	0	16,875	106,802	14,616	771	233	52.1	4	19.3
Virginia---------	1	11,196	100,372	13,437	7,021	272	41.8	455	1.5
Washington--------	2	11,003	131,083	10,781	9,608	217	65.4	377	2.5
West Virginia-----	0	2,498	20,518	3,694	2,507	82	29.5	183	1.4
Wisconsin--------	5	90,036	1,110,556	169,684	19,408	2,180	58.7	194	10.0
Wyoming----------	0	553	5,521	622	9,271	22	27.9	661	1.4
AI activity reported by studs, but State unknown 7/-------	-	26,626	237,339	37,112	13,156	-----	----	-----	----
International Beef Breeders 8/------	-	------	---------	-------	49,175	-----	----	-----	----
Semen services reported from ranchers' bulls 8/---------	-	------	---------	-------	94,673	-----	----	-----	----
United States--	35	818,630	6,413,453	873,127	647,143	15,201	47.9	34,592	1.9

1/ States without studs purchase semen from studs in other States. See table 7 for name and location of studs.
2/ Data for registered cows may be all or partially estimated when incomplete report was given.
3/ Preliminary figures for number of cows and heifers 2 years old and over kept for milk estimated by the Statistical Reporting Service (USDA).
4/ Percentage of all dairy cows bred included in the artificial insemination program. Percentages for individual States may be affected, since no State breakdown for 258,997 dairy cows was reported by Carnation Farms Breeding Service.
5/ Preliminary figures for other cattle and calves 2 years and older; estimated by the Statistical Reporting Service (USDA).
6/ Percentage of all beef cows bred included in the artificial insemination program.
7/ AI breeding activity reported from: Carnation Farms, 271,153 cows; Curtiss, 2,000 cows; Tri State, 14,454 cows. Total: 287,607 cows.
8/ Information obtained from National Association of Animal Breeders, P.O. Box 1033, Columbia, Mo. 65201.

TABLE 2.--States with the highest number and percentage of dairy and beef cows bred artificially in 1966

Dairy cows

Rank	State	Cows bred artificially	Rank	State	Cows breed artificially.
		Number			Percent
1	Wisconsin	1,280,240	1	Florida	71.5
2	New York	726,527	2	Pennsylvania	65.9
3	Minnesota	627,419	3	Washington	65.4
4	Pennsylvania	558,560	4	Massachusetts	64.9
5	California	389,725	5	Connecticut	64.3
6	Michigan	317,169	6	Maine	63.9
7	Ohio	308,083	7	Utah	63.6
8	Illinois	210,676	8	New Mexico	62.6
9	Iowa	161,337	9	New York	60.7
10	Missouri	141,986	10	New Hampshire	59.1
		Beef cows			
1	Kansas	44,298	1	Massachusetts	20.6
2	Montana	33,966	2	Vermont	19.3
3	Texas	29,697	3	Connecticut	14.9
4	Iowa	29,350	4	Pennsylvania	10.3
5	Illinois	22,465	5	Wisconsin	10.0
6	Ohio	22,295	6	New Jersey	7.5
7	Nebraska	22,117	7	Ohio	7.1
8	Tennessee	19,420	8	Michigan	6.7
9	Wisconsin	19,408	9	New York	6.7
10	Missouri	18,771	10	New Hampshire	5.8

TABLE 3.--Comparison of artificial breeding in the United States for years 1965 and 1966

State	Dairy cows bred artificially in--				Beef cows bred artificially in--		
	1965	1966	Increase or decrease	Increase or decrease 1/	1965	1966	Increase or decrease
	Number	Number	Number	Percent	Number	Number	Number
Alabama	46,170	47,254	+1,084	+4.4	2,188	2,189	+1
Alaska	1,983	783	-1,200	-45.3	73	-----	-73
Arizona	15,854	19,036	+3,182	+5.7	1,807	6,863	+5,056
Arkansas	25,750	27,632	+1,882	+7.2	3,549	3,614	+65
California	382,603	389,725	+7,122	+1.3	19,044	15,153	-3,891
Colorado	44,386	35,228	-9,158	-6.7	6,072	5,747	-325
Connecticut	49,429	49,499	+70	+1.7	1,267	596	-671
Delaware	8,794	8,685	-109	+13.1	166	150	-16
Florida	111,416	135,132	+23,716	+11.6	8,727	11,783	+3,056
Georgia	62,159	58,051	-4,108	+2.0	4,260	4,474	+214
Hawaii	10,210	7,262	-2,948	-11.3	498	1,312	+814
Idaho	78,894	77,411	-1,483	+4.6	6,247	6,825	+578
Illinois	221,790	210,676	-11,114	+3.7	20,760	22,465	+1,705
Indiana	137,831	132,024	-5,807	+5.1	11,252	13,555	+2,303
Iowa	282,823	161,337	-121,486	-14.4	23,893	29,350	+5,457
Kansas	84,858	88,053	+3,195	+5.6	23,848	44,298	+20,450
Kentucky	114,240	129,854	+15,614	+5.9	19,296	15,899	-3,397
Louisiana	65,762	70,038	+4,276	+4.0	6,107	10,987	+4,880
Maine	50,149	49,185	-964	+6.9	510	92	-418
Maryland	85,833	85,829	-4	+5.6	3,085	2,306	-779
Massachusetts	47,787	50,590	+2,803	+7.3	1,669	823	-846
Michigan	339,439	317,169	-22,270	+1.9	5,409	8,280	+2,871
Minnesota	641,692	627,419	-14,273	+2.0	10,094	12,046	+1,952
Mississippi	61,135	51,967	-9,168	-1.3	2,835	5,023	+2,188
Missouri	139,918	141,986	+2,068	+6.6	22,063	18,771	-3,292
Montana	14,181	13,640	-541	+3.6	24,687	33,966	+9,279
Nebraska	58,944	46,833	-12,111	-1.6	19,337	22,117	+2,780
Nevada	3,821	4,089	+268	+3.4	871	1,444	+573
New Hampshire	29,482	26,574	-2,908	-2.3	1,171	116	-1,055
New Jersey	58,634	58,461	-173	+4.4	325	447	+122
New Mexico	26,770	25,683	-1,087	+.3	1,609	1,182	-427
New York	716,707	726,527	+9,820	+4.4	4,186	3,347	-839
North Carolina	90,983	90,857	-126	+4.4	5,147	7,918	+2,771
North Dakota	29,089	26,543	-2,546	+.3	8,033	15,053	+7,020
Ohio	319,896	308,083	-11,813	+1.2	20,426	22,295	+1,869
Oklahoma	28,596	23,938	-4,658	-.6	9,738	7,564	-2,174
Oregon	72,075	66,552	-5,523	-1.1	9,515	5,736	-3,779
Pennsylvania	570,930	558,560	-12,370	-.1	9,701	10,499	+798
Puerto Rico	52,540	50,712	-1,828	-----	------	------	-------
Rhode Island	6,338	4,412	-1,926	-13.5	148	3	-145
South Carolina	29,478	33,182	+3,704	+8.0	1,741	3,822	+2,081
South Dakota	37,579	33,090	-4,489	-1.5	6,393	10,200	+3,807
Tennessee	99,918	97,343	-2,575	+3.6	13,158	19,420	+6,262
Texas	89,751	104,750	+14,999	+6.5	22,526	29,697	+7,171
Utah	50,804	52,789	+1,985	+9.6	3,498	4,126	+628
Vermont	122,305	121,418	-887	+3.8	4,632	771	-3,861
Virginia	114,874	113,809	-1,065	+5.2	5,769	7,021	+1,252
Washington	141,243	141,864	+621	+7.0	16,787	9,608	-7,179
West Virginia	24,031	24,212	+181	+6.8	1,414	2,507	+1,093
Wisconsin	1,351,829	1,280,240	-71,589	-.5	21,406	19,408	-1,998
Wyoming	6,932	6,143	-789	+2.2	7,332	9,271	+1,939
AI activity reported by studs, but State unknown 2/	6,200	274,451	+268,251	-----	477	13,156	+12,679
All-beef studs 2/	-------	-------	-------	-----	141,500	49,175	-92,325
Semen services reported from ranchers' bulls 2/	-------	-------	-------	-----	48,901	94,673	+45,772
United States	7,264,835	7,286,580	+21,745	+4.2	615,147	647,143	+31,996

1/ Derived from all dairy cows bred in the artificial insemination program as a percentage of all milk cows in the United States.

2/ For year 1966, see table 1 and footnotes. For year 1965, see table 1 and footnotes in the April 1966 Dairy Herd Improvement Letter covering the Artificial Insemination Participation Report for 1965.

TABLE 4 .--Status of artificial-breeding program in the United States (1939-1967, inclusive)

Year	Studs	Sires in service				Herds[1]	Dairy cows bred to-		Beef cows bred to beef bulls	Total cattle bred	Cows bred per sire
		Dairy	Beef	Total	Average per stud		Dairy bulls	Beef bulls			
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
1939	7	--	--	33	4.7	646	--	--	--	7,359	228
1940	25	--	--	138	5.5	2,971	--	--	--	33,977	246
1941	35	--	--	237	6.8	5,997	--	--	--	70,751	299
1942	46	--	--	412	9.0	12,118	--	--	--	112,788	274
1943	59	--	--	574	9.7	23,448	--	--	--	182,524	318
1944	56	--	--	657	11.7	28,627	--	--	--	218,070	332
1945	67	--	--	729	10.9	43,998	--	--	--	360,732	495
1946	78	--	--	900	11.5	73,293	--	--	--	537,376	597
1947	84	--	--	1,453	17.3	140,571	--	--	--	1,184,168	815
1948	91	--	--	1,745	19.2	224,493	--	--	--	1,713,581	982
1949	90	--	--	1,940	21.6	316,177	--	--	--	2,091,175	1,078
1950	97	--	--	2,104	21.7	409,300	--	--	--	2,619,555	1,245
1951	94	--	--	2,187	23.3	548,300	--	--	--	3,509,573	1,605
1952	94	--	--	2,324	24.7	671,100	--	--	--	4,295,243	1,848
1953	96	--	--	2,598	27.1	755,000	--	--	--	4,845,222	1,865
1954	93	--	--	2,661	28.6	805,000	--	--	--	5,155,240	1,937
1955	79	--	--	2,450	31.0	845,900	--	--	--	5,413,874	2,210
1956	79	--	--	2,553	32.3	900,400	--	--	--	5,762,656	2,257
1957	75	--	--	2,651	35.3	946,000	--	--	--	6,055,982	2,284
1958	71	--	--	2,676	37.7	975,372	--	--	--	6,645,568	2,483
1959	64	--	--	2,460	38.4	930,059	--	--	--	6,932,294	2,816
1960	62	--	--	2,544	41.0	910,000	--	--	--	7,144,679	2,808
1961	56	--	--	2,486	44.4	863,781	7,047,148	2/435,592	--	7,482,740	3,010
1962	56	2,036	420	2,456	43.9	862,150	6,837,681	2/911,006	--	7,748,687	3,155
1963	51	2,158	401	2,559	50.2	621,141	6,468,545	969,748	235,289	7,673,582	2,999
1964	50	2,140	398	2,538	50.8	654,311	6,165,599	1,117,395	464,959	7,747,953	3,053
1965	3/46	1,867	449	2,316	50.3	591,859	6,301,178	963,657	615,147	7,879,982	3,402
1966	3/44	1,949	439	2,388	54.3	540,265	6,413,453	873,127	647,143	4/7,933,723	3,322
1967	35	2,012	364	2,376	67.9	--	--	--	--	--	--

1/ Prior to 1963, number of herds largely reflected membership rather than those actually serviced.
2/ Probably includes some beef to beef inseminations.
3/ Includes one all-beef stud.
4/ Not shown are inseminations to 5,267 swine and 97 goats.

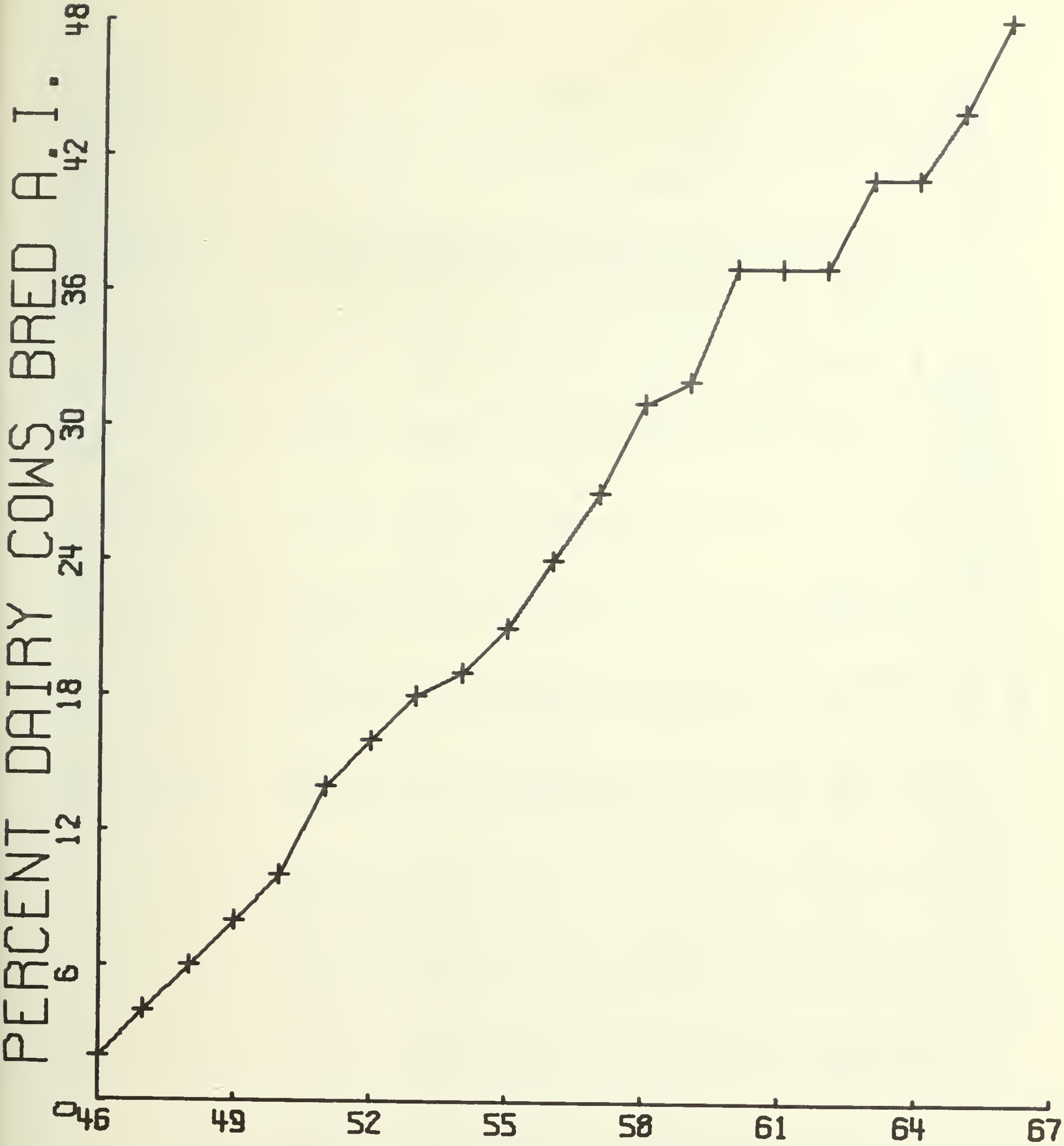


Figure 1.--Yearly trends in the percent of U.S. dairy cows bred artificially since 1946.

TABLE 5.--Cows bred in artificial-breeding organization bull studs during 1966

Stud code	Name of stud 1/	Herds serviced	Cows bred in 1966								Estimated total number of cows bred	Total bulls used 2/	Insemina- tions of--	
			First services				Semen transactions							
							Semen sales		Custom-frozen					
			Dairy total	Dairy to beef	Beef to beef	Total first services	Dairy to dairy	Beef to beef	Dairy to dairy	Beef to beef			Swine	Goats
		Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	-----Number	------	
2110	Eastern AIC-------	46,401	664,367	77,148	775	742,290	3,342	-----	-----	-----	745,632	289	----	--
2301	Zimmerman---------	3/47	800	------	-----	800	-----	-----	3,500	-----	4,300	4	----	--
2309	Atlantic----------	16,073	192,722	33,262	3,696	229,680	350	50	-----	-----	230,080	75	----	22
2311	NEBA--------------	16,950	177,193	27,324	1,350	205,867	384	-----	-----	-----	206,251	91	----	--
3102	NOBA--------------	11,291	195,331	36,267	8,642	240,240	2,796	36	1,328	665	245,065	67	----	4
3202	John A. Newman----	15	350	------	-----	350	-----	-----	-----	-----	350	2	----	--
3303	Curtiss-----------	74,160	976,069	149,650	54,000	1,179,719	-----	-----	1,000	1,000	1,181,719	162	----	--
3401	Michigan ABC------	17,596	203,969	23,697	6,000	233,666	908	-----	-----	-----	234,574	91	----	12
3501	Associated--------	1,500	6,772	1,822	31	8,625	-----	-----	-----	-----	8,625	19	----	--
3502	Badger------------	20,799	345,723	49,912	4,280	399,915	1,308	20	-----	-----	401,243	63	----	--
3503	East Central------	4,500	75,754	13,944	300	89,998	2,987	-----	-----	-----	92,985	37	----	--
3505	Tri State---------	23,629	399,229	3/59,810	3/10,879	469,918	14,454	-----	-----	-----	484,372	102	4,171	--
3575	ABS---------------	3/86,335	1,202,270	127,616	137,814	1,467,700	-----	-----	-----	-----	1,467,700	293	----	--
4101	Minnesota Valley--	43,442	273,045	43,857	4,870	321,772	-----	-----	-----	-----	321,772	104	----	--
4125	Midwest Genes-----	3/43,958	308,207	3/51,699	3/30,002	389,908	1,230	14,600	-----	10,000	415,738	109	----	--
4801	Kansas ABSU-------	3,000	40,394	3,290	26,464	70,148	2,968	12,950	-----	-----	86,066	48	----	9
5102	Maryland-West Va--	5,075	74,893	9,908	3,478	88,279	484	-----	-----	-----	88,763	55	----	--
5201	Virginia ABA------	7,200	63,951	9,195	3,941	77,087	79	8	750	2,438	80,362	30	----	8
5501	N.C. Inst. B. P---	10	1,017	------	-----	1,017	102	-----	300	300	1,719	15	----	--
6102	Select Sires------	3/47,571	385,708	3/61,884	3/62,036	509,628	851	639	4,821	12,862	528,801	233	1,096	30
6301	East Tennessee----	3/1,803	22,836	4,898	2,921	30,655	-----	-----	-----	2,637	33,292	34	----	--
6302	Tennessee ABA-----	5,200	25,707	4,869	4,000	34,576	150	-----	-----	3,000	37,726	19	----	--
6303	West Tennessee----	1,680	6,720	565	2,765	10,050	250	75	-----	-----	10,375	16	----	--
6502	Mississippi ABC---	300	20,400	4,845	255	25,500	2,300	23	-----	-----	27,823	12	----	--
7201	Louisiana ABC-----	5,638	59,129	9,426	6,500	75,055	200	50	-----	4,000	79,305	42	----	--
8401	Colorado St. Univ-	------	-------	------	-----	-------	550	2,250	1,119	6,056	9,975	2	----	--
8701	Cache Valley------	8,355	59,620	7,326	14,226	81,172	-----	8,808	-----	-----	89,980	53	----	--
9111	Carnation---------	3/15,950	221,885	37,112	12,156	271,153	-----	-----	-----	-----	271,153	101	----	--
9113	All West----------	29,000	169,409	3/12,687	3/6,136	188,232	-----	-----	-----	-----	188,232	85	----	--
9302	Adohr-------------	20	5,869	------	-----	5,869	2,198	-----	-----	-----	8,067	24	----	--
9303	Excelsior---------	139	17,777	200	20	17,997	12,625	50	-----	-----	30,672	22	----	--
9305	Jessup------------	1,568	75,991	9,903	1,752	87,646	-----	-----	12,700	8,600	108,946	51	----	12
9310	Pacific-----------	600	26,854	3/1,011	3/489	28,354	10,820	2,400	-----	-----	41,574	14	----	--
9401	Puerto Rico ABA---	400	26,092	------	-----	26,092	-----	-----	-----	-----	26,092	7	----	--
9601	Matanuska Valley--	60	546	------	-----	546	-----	-----	-----	-----	546	5	----	--
STUDS OR RANCHERS SERVICING ONLY BEEF CATTLE														
8406	International Beef Breeders 4/------	------	-------	-----	49,175	49,175	-----	-----	-----	-----	49,175	---	----	--
	Semen services reported from ranchers' bulls 4/---------	------	-------	-----	94,673	94,673	-----	-----	-----	-----	94,673	---	----	--
	United States--------	540,265	6,326,599	873,127	553,626	7,753,352	61,336	41,959	25,518	51,558	7,933,723	2,376	5,267	97

1/ See table 7 for list of names and addresses of studs.
2/ See table 5 for breakdown of bulls by stud, by breed.
3/ Data may be all or partially estimated when incomplete report was given.
4/ Information obtained from National Association of Animal Breeders, P.O. Box 1033, Columbia, Mo. 65201.

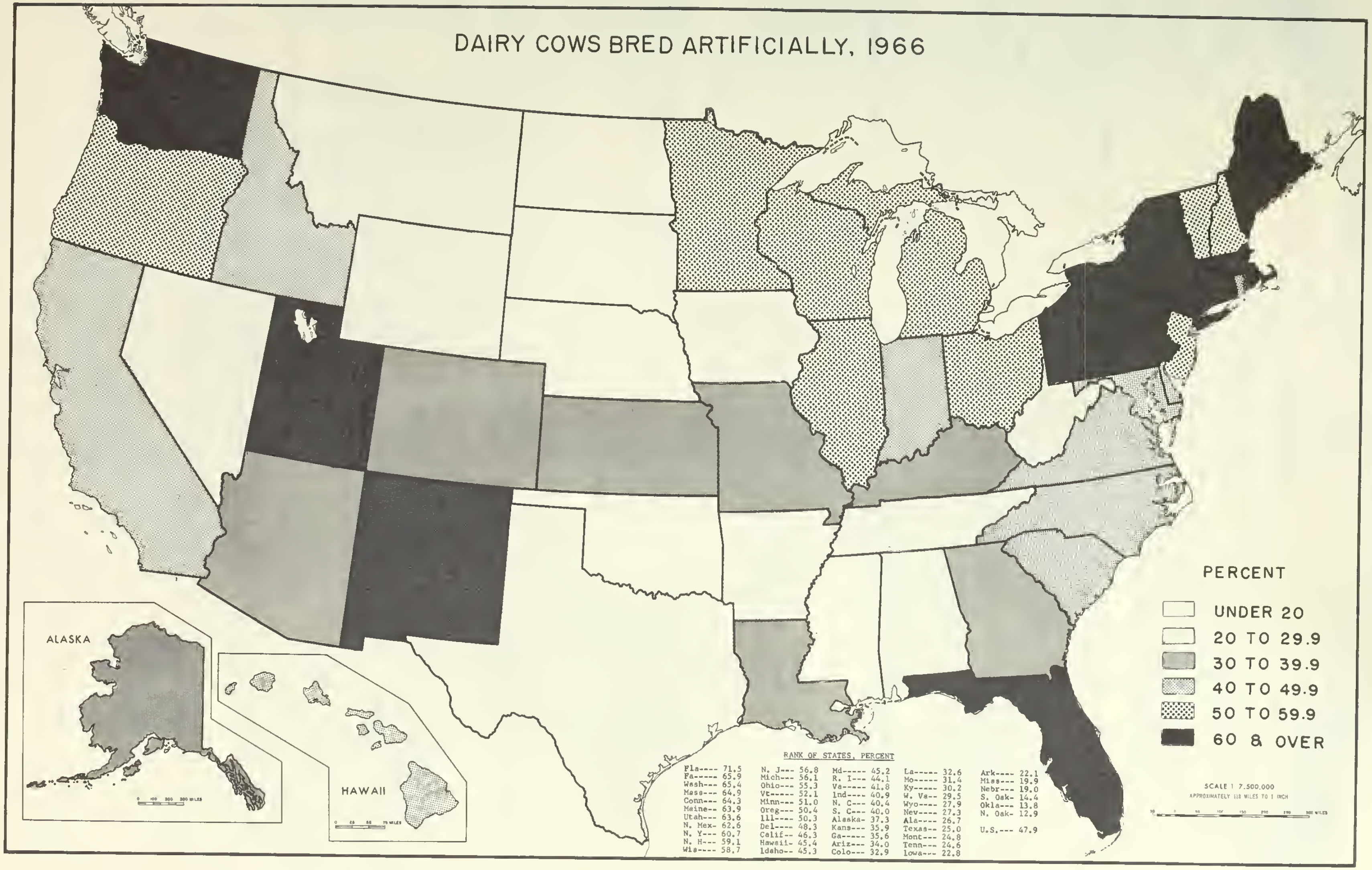
TABLE 8.--Bulls used in artificial-breeding organizations during 1966

Stud code	Name of stud 1/	Bulls by breed 2/ Ayr-shire	Brown Swiss	Guern-sey	Hol-stein	Jer-sey	Red Dane	Short-horn	Beef	Total	Type of service by dairy bulls Regular	Special or planned mating	Progeny testing
		Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
2110	Eastern AIC-------	14	11	36	171	45	--	--	12	289	76	15	186
2301	Zimmerman---------	--	--	--	4	--	--	--	--	4	4	--	---
2309	Atlantic----------	2	4	15	35	7	--	--	12	75	49	12	2
2311	NEBA--------------	4	4	14	55	9	--	--	5	91	36	1	49
3102	NOBA--------------	--	3	11	32	15	--	1	5	67	38	6	18
3202	John A. Newman----	3/	3/	3/	3/	3/	3/	3/	--	2	2	--	---
3303	Curtiss-----------	4	5	13	78	11	--	3	48	162	110	--	4
3401	Michigan ABC------	--	2	15	49	7	4	4	10	91	40	8	33
3501	Associated--------	--	--	3	13	--	--	--	3	19	16	--	---
3502	Badger------------	--	6	13	38	2	--	--	4	63	50	--	9
3503	East Central------	--	3	3	24	--	--	--	7	37	28	2	---
3505	Tri State---------	--	3	17	61	4	--	2	15	102	68	--	19
3575	ABS---------------	2	2	7	234	12	--	--	36	293	70	9	178
4101	Minnesota Valley--	1	4	11	65	--	--	1	22	104	24	--	58
4125	Midwest Genes-----	--	3	11	54	5	--	4	32	109	69	3	5
4801	Kansas ABSU-------	3	2	1	24	2	--	2	4/14	48	34	--	---
5102	Maryland-West Va--	4	3	7	29	5	--	--	7	55	29	--	19
5201	Virginia ABA------	1	--	5	16	5	--	--	3	30	11	--	16
5501	N.C. Inst. B. P---	--	--	--	15	--	--	--	--	15	3	--	12
6102	Select Sires------	4	21	32	124	22	--	4	26	233	113	32	62
6301	East Tennessee----	1	1	6	10	8	--	1	7	34	27	--	---
6302	Tennessee ABA-----	--	3	3	5	6	--	--	2	19	16	1	---
6303	West Tennessee----	--	--	--	6	4	--	--	6	16	10	--	---
6502	Mississippi ABC---	--	--	1	2	8	--	--	1	12	11	--	---
7201	Louisiana ABC-----	--	--	8	13	7	--	--	14	42	18	--	10
8401	Colorado St. Univ-	--	--	--	1	--	--	--	1	2	--	--	1
8701	Cache Valley------	--	1	1	22	2	--	--	27	53	12	5	9
9111	Carnation---------	1	6	10	53	4	--	2	25	101	76	--	---
9113	All West----------	--	--	16	36	20	--	--	13	85	72	--	---
9302	Adohr-------------	--	--	9	13	--	--	--	2	24	20	2	---
9303	Excelsior---------	--	1	--	21	--	--	--	--	22	11	2	9
9305	Jessup------------	1	2	8	31	5	--	--	4	51	28	9	10
9310	Pacific-----------	--	--	2	6	5	--	--	1	14	13	--	---
9401	Puerto Rico ABA---	--	--	--	7	--	--	--	--	7	7	--	---
9601	Matanuska Valley--	--	--	--	5	--	--	--	--	5	4	1	---
	United States-----------	42	90	278	1,352	220	4	24	364	2,376	1,195	108	709

1/ See table 7 for list of names and addresses of studs.
2/ These counts are based on where bulls are housed and does not reflect the fact that they are available to more than one stud.
3/ Unknown.
4/ Based on report of 1-1-66.

TABLE 7.--Artificial-breeding organization bull studs in the United States

State	Stud code	Name and address
Alaska-----------	9601	Matanuska Valley Breeders Association, Palmer 99645.
California-------	9302	Adohr Farms Inseminating Service, Rt. 1, P.O. Box 18, Camarillo 93010.
	9303	Excelsior Breeding Service, 7401 Adams Ave., Rt. 1, Box 128, Corona 91720.
	9305	Jessup Breeders, 5471 San Fernando Road West, Glendale 91203.
	9310	Pacific Breeders Coop., Inc., 1464 Middle Two Rock Road, Petaluma 94952.
Colorado---------	8401	Colorado State University ABS, 809 City Park Ave., Fort Collins 80521.
Illinois---------	3303	Curtiss Breeding Service, Inc., Cary 60013.
Indiana----------	3202	John A. Newman & Sons, Rt. 2, Box 21, Culver 46511.
Kansas-----------	4801	Kansas ABS Unit, Kansas State University, Anderson Hall, Manhattan 66504.
Louisiana--------	7201	La. Animal Breeders Coop., Inc., Louisiana State University, Box BD, Baton Rouge 70803.
Maryland---------	5102	Maryland-West Virginia Bull Stud, Inc., Box 555, Frederick 21701.
Michigan---------	3401	Michigan Animal Breeders Coop., Inc., P.O. Box 511, East Lansing 48824.
Minnesota--------	4125	Midwest Genes, Inc., Box 111, Anoka 55303.
	4101	Minnesota Valley Breeders Association, New Prague 56071.
Mississippi------	6502	Mississippi Animal Breeders Coop., Drawer BA, State College 39762.
New York---------	2110	Eastern Artificial Insemination Coop., Inc., Box 518, Ithaca 14850.
North Carolina---	5501	N. C. Institutional Breeding Association, Department of Animal Science, 231 Polk Hall, North Carolina State University, Raleigh 27600.
Ohio-------------	3102	NOBA, Inc., Rt. 4, P.O. Box 607, Tiffin 44883.
	6102	Select Sires, Inc., 1224 Alton-Darby Road, Columbus 43228.
Pennsylvania-----	2309	Atlantic Breeders Coop., Rt. 230 By-Pass, Box 254, Lancaster 17604.
	2311	Northeastern Breeders Association, Inc., R.D. 2, Tunkhannock 18657.
	2301	Zimmerman Dairy Farm, Rt. 2, Lehighton 18235.
Puerto Rico------	9401	Puerto Rico Artificial Breeding Association, P.O. Box 958, Dorado 00646.
Tennessee--------	6301	East Tennessee ABA, Rt. 10, Tipton Station Road, Knoxville 37920.
	6302	Tennessee Artificial Breeding Association, Rt. 2, Granny White Pike, Brentwood 37027.
	6303	West Tennessee ABA, Box 38, Yorkville 38389.
Utah-------------	8701	Cache Valley Breeding Association, 1950 North Main, Logan 84321.
Virginia---------	5201	Virginia Animal Breeders Association, Inc., P.O. Drawer 391, Rocky Mount 24151.
Washington-------	9113	All West Breeders, P.O. Box 197, Burlington 98233.
	9111	Carnation Farms Breeding Service, Carnation 98014.
Wisconsin--------	3575	American Breeders Service, Inc., De Forest 53532.
	3501	Associated Breeding Service, Lena 54139.
	3502	Badger Breeders Coop., Rt. 2, P.O. Box 469, Shawano 54166.
	3503	East Central Breeders Association Coop., P.O. Box 191, Waupun 53963.
	3505	Tri State Breeders Coop., Westby 54667.
ALL-BEEF STUD		
Colorado---------	8406	International Beef Breeders, Inc., P.O. Box 29007, Denver 80229.



DAIRY COWS BRED ARTIFICIALLY, 1966

RANK OF STATES, PERCENT

Fla----	71.5	N. J---	56.8	Md-----	45.2	La-----	32.6	Ark----	22.1
Pa-----	65.9	Mich---	56.1	R. I---	44.1	Mo-----	31.4	Miss---	19.9
Wash---	65.4	Ohio---	55.3	Va-----	41.8	Ky-----	30.2	Nebr---	19.0
Mass---	64.9	Vt-----	52.1	Ind----	40.9	W. Va--	29.5	S. Dak-	14.4
Conn---	64.3	Minn---	51.0	N. C---	40.4	Wyo----	27.9	Okla---	13.8
Maine--	63.9	Oreg---	50.4	S. C---	40.0	Nev----	27.3	N. Dak-	12.9
Utah---	63.6	Ill----	50.3	Alaska-	37.3	Ala----	26.7		
N. Mex-	62.6	Del----	48.3	Kans---	35.9	Texas--	25.0	U.S.---	47.9
N. Y---	60.7	Calif--	46.3	Ga-----	35.6	Mont---	24.8		
N. H---	59.1	Hawaii-	45.4	Ariz---	34.0	Tenn---	24.6		
Wis----	58.7	Idaho--	45.3	Colo---	32.9	Iowa---	22.8		

EXTENSION SERVICE OFFICIALS WORKING WITH DAIRY BREEDING ASSOCIATIONS IN THE STATES

Ala------ R. S. Jones, Jr., Dairy Science Dept., Auburn University, Auburn 36830.
Alaska--- W. J. Sweetman, Experiment Station Research Staff, University of Alaska, Palmer 99645.
Ariz----- W. R. Van Sant, Dept. of Dairy Science, University of Arizona, Tucson 85721.
Ark------ L. Ratcliff, Animal Industry & Veterinary Science Dept., University of Arkansas, Little Rock 72203.
Calif---- R. D. Appleman, Extension Service, University of California, Davis 95616.
Colo----- D. C. Jordan, Animal Science Dept., Colorado State University, Fort Collins 80521.
Conn----- R. H. Benson, Animal Industries Dept., University of Connecticut, Storrs 06268.
Del------ W. R. Hesseltine, Animal and Poultry Science Dept., University of Delaware, Newark 19711.
Fla------ C. W. Reaves, Extension Dairy Section, University of Florida, Gainesville 32603.
Ga------- J. N. Maddux, Animal Industry Division, University of Georgia, Athens 30601.
Hawaii--- H. R. Donoho, Animal Science Dept., University of Hawaii, Honolulu 96822.
Idaho---- G. W. Cleveland, Dairy Science Dept., University of Idaho, P.O. Box 300, Boise 8370
Ill------ J. G. Cash, Dairy Science Dept., University of Illinois, Urbana 61803.
Ind------ N. J. Moeller, Dept. of Animal Sciences, Purdue University, Lafayette 47907.
Iowa----- B. R. Eastwood, Animal and Dairy Science Dept., Iowa State University, Ames 50010.
Kans----- E. R. Bonewitz, Dairy Science Dept., Kansas State University, Manhattan 66504.
Ky------- J. C. Wilk, Dairy Science Dept., University of Kentucky, Lexington 40506.
La------- H. W. Anderson, La. Agr. Extension Service, Louisiana State University, Baton Rouge 70803.
Maine---- H. G. Gray, Animal Science Dept., University of Maine, Orono 04473.
Md------- C. M. Chance, Dairy Science Dept., University of Maryland, College Park 20742.
Mass----- S. N. Gaunt, Veterinary and Animal Sciences Dept., University of Massachusetts, Amherst 01003.
Mich----- C. E. Meadows, Dairy Genetics and Breeding, Michigan State University, East Lansing 48823.
Minn----- B. J. Conlin, Dept. of Animal Science, University of Minnesota, St. Paul 55101.
Miss----- G. B. Crain, Dairy Science Dept., Mississippi State University, State College 39762
Mo------- A. G. Lane, Dairy Husbandry Dept., University of Missouri, Columbia 65202.
Mont----- E. J. Peace, Dept. of Animal Science and Range Management, Montana State University, Bozeman 59715.
Nebr----- C. W. Nibler, Dairy Science Dept., University of Nebraska, Lincoln 68503.
Nev------ H. P. Adams, Animal Science Dept., University of Nevada, Reno 89507.
N. H----- C. H. Boynton, Animal Science Dept., University of New Hampshire, Durham 03824.
N. J----- E. T. Oleskie, Animal Science Dept., Rutgers University, New Brunswick 08903.
N. Mex--- J. B. Ells, Dairy Dept., New Mexico State University, University Park 88070.
N. Y----- R. Albrectsen, Animal Husbandry Dept., Cornell University, Ithaca 14850.
N. C----- F. D. Sargent, Animal Science Dept., North Carolina State University, Raleigh 27607.
N. Dak--- G. R. Fisher, Dairy Husbandry Dept., North Dakota State University, Fargo 58103.
Ohio----- C. D. McGrew, Dairy Science Dept., Ohio State University, Columbus 43210.
Okla----- C. H. Burton, Dept. of Dairying, Oklahoma State University, Stillwater 74075.
Oreg----- H. P. Ewalt, Animal Science Dept., Oregon State University, Corvallis 97331.
Pa------- L. W. Specht, Dairy Science Dept., Pennsylvania State University, University Park, 16802.
P. R----- M. J. Ortiz, Animal Husbandry Dept., University of Puerto Rico, Rio Piedras 00931.
R. I----- J. W. Atwood, Dairy Science Dept., University of Rhode Island, Kingston 02881.
S. C----- C. H. Lomas, Dairy Science Dept., Clemson University, Clemson 29631.
S. Dak--- E. Kurtz, Dairy Science Dept., South Dakota State University, Brookings 57007.
Tenn----- C. K. Chappell, Dairy Dept., University of Tennessee, Knoxville 37919.
Tex------ A. M. Meekma, Dairy Science Dept., Texas A & M University, College Station 77841.
Utah----- J. J. Barnard, Dairy Industry Dept., Utah State University, Logan 84321.
Vt------- W. P. Leamy, Animal and Dairy Science Dept., University of Vermont, Burlington 05401.
Va------- V. L. Baldwin, Dairy Science Dept., Virginia Polytechnic Institute, Blacksburg 24061.
Wash----- B. F. Kelso, W. W. Research and Extension Center, Puyallup 98371.
W. Va---- R. O. Kelley, Animal Industry and Veterinary Science Dept., West Virginia University, Morgantown 26506.
Wis------ E. E. Starkey, Dairy Science Dept., University of Wisconsin, Madison 53706.
Wyo------ I. W. Slater, Division of Animal Science, University of Wyoming, Laramie 82071.

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National Cooperative Dairy Herd Improvement Program
RECORD BOOK
A plan for every size herd
STANDARD DHIA OWNER SAMPLER WEIGH-A-DAY-A-MONTH
AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

ARS-44-194
Dairy-Herd-Improvement Letter (Vol. 43, No. 4)

August 1967 [1]

PRODUCTION LEVELS OF DHIA HERDS CONTINUE TO INCREASE

In 1966-67 [2] DHIA cows in the Standard recordkeeping plan produced an average of 12,307 pounds of milk and 468 pounds of butterfat. This record was made by 1,890,024 cows in 34,515 herds that averaged 54.8 cows per herd. Increases over 1965-66 amounted to 180 pounds of milk, 6 pounds of butterfat, and 1.7 cows per herd.

DHIA COWS EXCEED THE PRODUCTION OF ALL OTHER COWS

The importance of DHIA recordkeeping is evident from the fact that in 1966-67 milk production of Standard plan DHIA cows [3] exceeded that of all other cows by 57 percent,

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[1] Prepared by R. H. Miller, R. D. Plowman, C. A. Rampendahl, and J. J. Corbin from data submitted by State Extension Dairymen in Charge of DHIA.

[2] Double years refer to a testing year--the period that begins May 1 in the year stated first and ends April 30 in the year stated last. Unless stated otherwise, single years refer to a calendar year.

[3] The words "Standard plan DHIA cows" refer to cows in the herds of dairy farmers who keep records by the Standard DHIA plan. Other DHIA recordkeeping plans are the Owner-Sampler plan and the Weigh-a-Day-a-Month plan.

Issued October 1967

or 4,456 pounds. With milk from Standard plan DHIA herds valued at $5.24 per hundredweight, this superiority amounts to a yearly gross income advantage of $233 per cow or $11,650 for a 50-cow herd.

The changes in production of Standard plan DHIA cows and that of all other cows since 1960 are shown in figure 1. These statistics demonstrate the importance and results of participating in DHIA recordkeeping. The production performance of Standard plan DHIA cows and that of all other cows is summarized in table 1.

STANDARD PLAN DHIA SUMMARIES 1966-67

Table 2 is a summary of the Standard plan DHIA cow-year averages for herds reporting complete information (including feeding data) over the last 10 years. In 1966-67, 1,282,357 cows in 27,483 herds with complete reports averaged 12,030 pounds of milk and 459 pounds of butterfat. They were fed an average of 4,700 pounds of concentrate, 11,300 pounds of succulent forage, and 3,600 pounds of dry forage. They produced milk valued at $631 ($5.24 per cwt.), were fed at an estimated cost of $265, and returned an estimated $366 over feed cost. A summary of the 10-year change is also shown in table 2.

The yearly changes shown in table 2 may partially reflect changes in breed composition of herds in the Standard DHIA recordkeeping plan. Some significant trends are indicated by these data. In the 9 preceding years beginning with 1957-58, production increased by 21.4 percent, but income over feed cost increased by only 11.4 percent. During this time the cost of grain and the price received per 100 pounds of milk were essentially unchanged. However, the prices dairymen paid for equipment, labor, and other items increased steadily, indicating that only increases in the efficiency of production have enabled many dairymen to stay in operation.

In the 1966-67 testing year the picture improved somewhat. Production in the 27,483 herds reporting complete data increased by 145 pounds of milk and 6 pounds of butterfat. For the first time in many years, prices received for milk showed a marked improvement, increasing from $4.70 to $5.24 per hundredweight. Because of this, income over feed cost showed a gain of about 20 percent compared to the previous year. Feed cost per cow increased by 3.5 percent. Although the data reported here do not reflect prices paid for other items, these costs have increased at a more rapid rate than feed costs.

The economic picture for dairymen in the Standard DHIA recordkeeping plan improved somewhat in the 1966-67 testing year because of a rise in the price of milk and, to a lesser extent, to a continued increase in production efficiency. However, recent information indicates that the price of milk is weakening somewhat, whereas the prices farmers pay for other items continue to increase.

Statistical summaries for herds in the Standard DHIA recordkeeping plan for 1966-67 are shown in tables 3 through 8. Cow-year averages for milk and fat yield of all herds in the Standard DHIA plan are shown in table 3. State averages based on those herds reporting complete feeding and cost data are shown in table 4.

Stratifications of herd averages by level of butterfat production, percentage of days in milk, and concentrates fed are given in tables 5, 6, and 7, respectively. The apparent trends in these tabulations should be interpreted with caution because of the possible confusing effects due to disproportionate representation of breeds and factors associated with geographical regions such as milk prices, feeding systems, etc.

The percentage of days in milk should be influenced least by these factors. Value of product and income over feed cost show consistent increases as the herd average for the percentage of days in milk increases, whereas feed cost per hundredweight of milk decreases. Apparently, this is a significant measure of the quality of herd management. It is interesting to note that herds with the ratio of days in milk averaging 83 percent and higher show an above-average return for income over feed cost per cow, i.e.; greater than $359.

Stratifications of Standard plan DHIA herd averages by level of milk yield are shown in table 8. Breeds are tabulated separately to eliminate complications resulting from breed differences in production and in prices of feed and milk. Such tabulations are useful in establishing guidelines for production efficiency.

Figures 2 and 3 portray the relationships among herd average milk yield and value of product per cow and feed cost per cow, for the Ayrshire, Guernsey, Holstein, Jersey, and Brown Swiss breeds. The trends are similar for each breed--the value of product per cow rises much more rapidly than feed cost per cow as the level of herd production increases. Although no data on costs other than feed are given here, it can be anticipated that these costs do not increase with yield level as rapidly as feed costs. Therefore, the proportionate increase in net profit per cow is likely to be even greater than is indicated in figures 2 and 3. These relationships vividly demonstrate the economic gains that can be achieved by increasing output per cow through better feeding, management, and breeding.

A commonly used rule of thumb in dairying is that profitable production is realized only if income is more than twice the cost of feed. For average United States conditions, the levels of milk production at or below which profits are not expected are shown in table 9.

Only 1 percent of the Standard plan DHIA herds with complete reports produced less than the milk levels necessary for profitable production indicated by table 9. However, if it is assumed that production levels of 7,500 pounds per cow are minimal for profit among herds at large, approximately half of the cows not in Standard plan DHIA recordkeeping are marginal or submarginal producers. In reality these estimates are probably conservative. Costs of equipment, labor,and other items have been increasing much more rapidly than feed costs and therefore, these charges doubtless constitute more than 50 percent of the costs of production.

For the Holstein herds summarized in table 8, estimated income over feed cost increased approximately $34 per cow for each 1,000-pound increase in milk production. As herd yields increased from 8,000 to 17,000 pounds of milk, feed costs increased 65 percent, feed cost per hundredweight of milk decreased 22 percent, and income over feed cost increased 159 percent. Assuming "net profit" roughly equals value of product less twice feed cost, income increased sharply as the production level increased. At milk production intervals of 1,000 pounds for herds averaging 10,000 to 19,000 pounds, the estimated net profit per year per cow was 50, 68, 89, 109, 130, 155, 167, 203, 192, and 216 dollars, respectively. As mentioned above, these values are too high because nonfeed costs probably represent more than one-half of total production costs.

An interesting trend evident in tables 5, 6, and 8 concerns the relationship of herd size to production and quality of management. There appears to be a tendency for the highest levels of production to be characterized by smaller than average herd size. In addition, table 6 suggests that the average percentage of days in milk tends to be higher for the smaller herds. However, regional differences may have some influence on these relations.

It should be kept in mind that the applicability of these DHIA herd statistics to individual herds will have the greatest meaning where local feeding systems, feed costs, and milk prices are reasonably consistent with U.S. average conditions. Herds of the same breed and with similar milk production levels may differ considerably in production efficiency if there are marked differences in milk prices, feeding practices, feed costs, labor costs, etc.

OWNER-SAMPLER PLAN HERD SUMMARIES 1966-67

Summaries of herds in the DHIA Owner-Sampler recordkeeping plan are shown in tables 10 to 15. A total of 575,816 cows in 17,912 herds averaged 11,607 pounds of milk and 432 pounds of butterfat in 1966-67. This is an increase of 135 pounds of milk and 7 pounds of butterfat over the previous year. Owner-Sampler plan herds decreased by 1,260 compared to the previous year, although some herds may have transferred to the Standard recordkeeping plan. The number of cows on Owner-Sampler test decreased by only 22,317.

Cow-year averages by States for all Owner-Sampler plan herds are given in table 10. Similar averages, but based on reports including feeding data, are shown in table 11. Stratification of Owner-Sampler plan herds by butterfat production, percent days in milk, and level of concentrates fed are shown in tables 12, 13, and 14, respectively. These tabulations show trends similar to those for herds in the Standard DHIA recordkeeping plan. The 1966-67 Owner-Sampler yearly herd averages summarized by breed and stratified by level of milk production are shown in table 15.

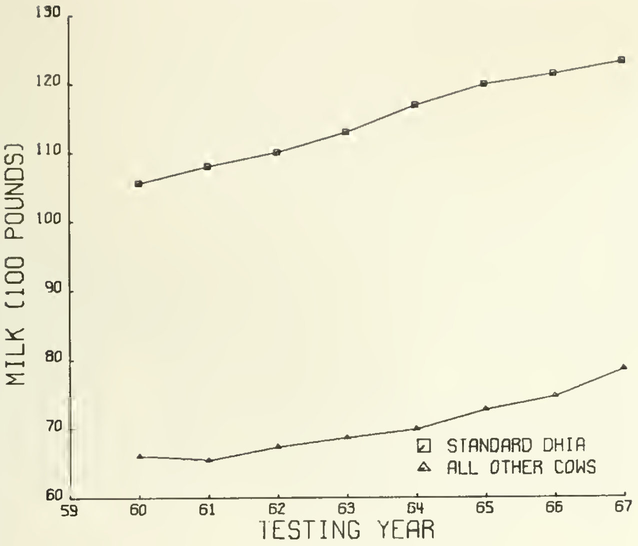

Figure 1.--Comparison of milk production for cows in Standard DHIA recordkeeping plan and for all other cows.

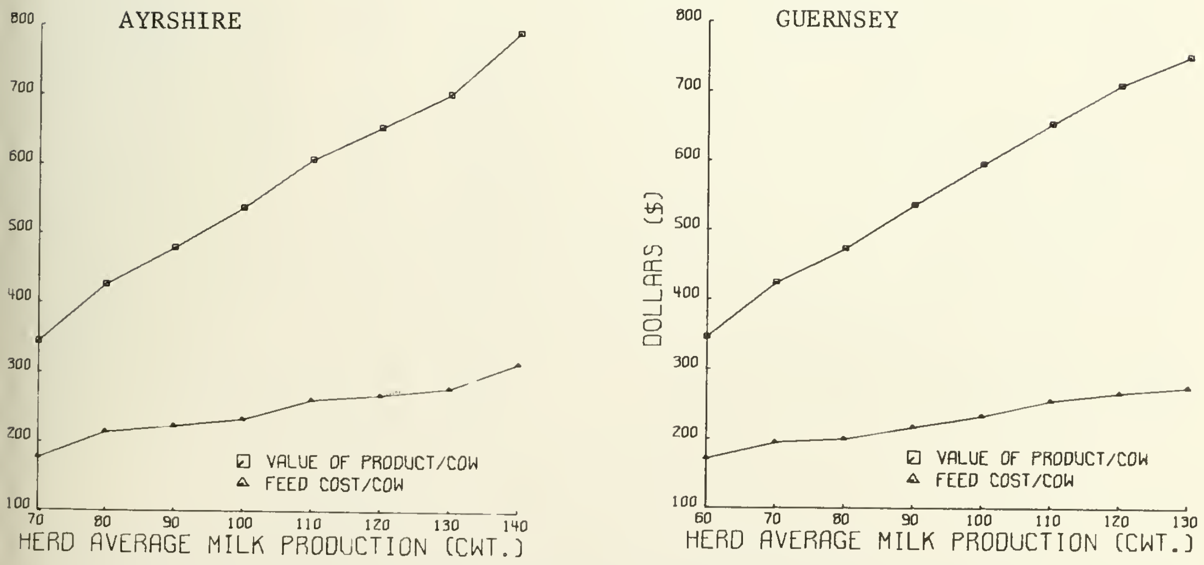

Figure 2.--Value of product and feed cost by level of production for herds in Standard DHIA recordkeeping plan: Ayrshire and Guernsey.

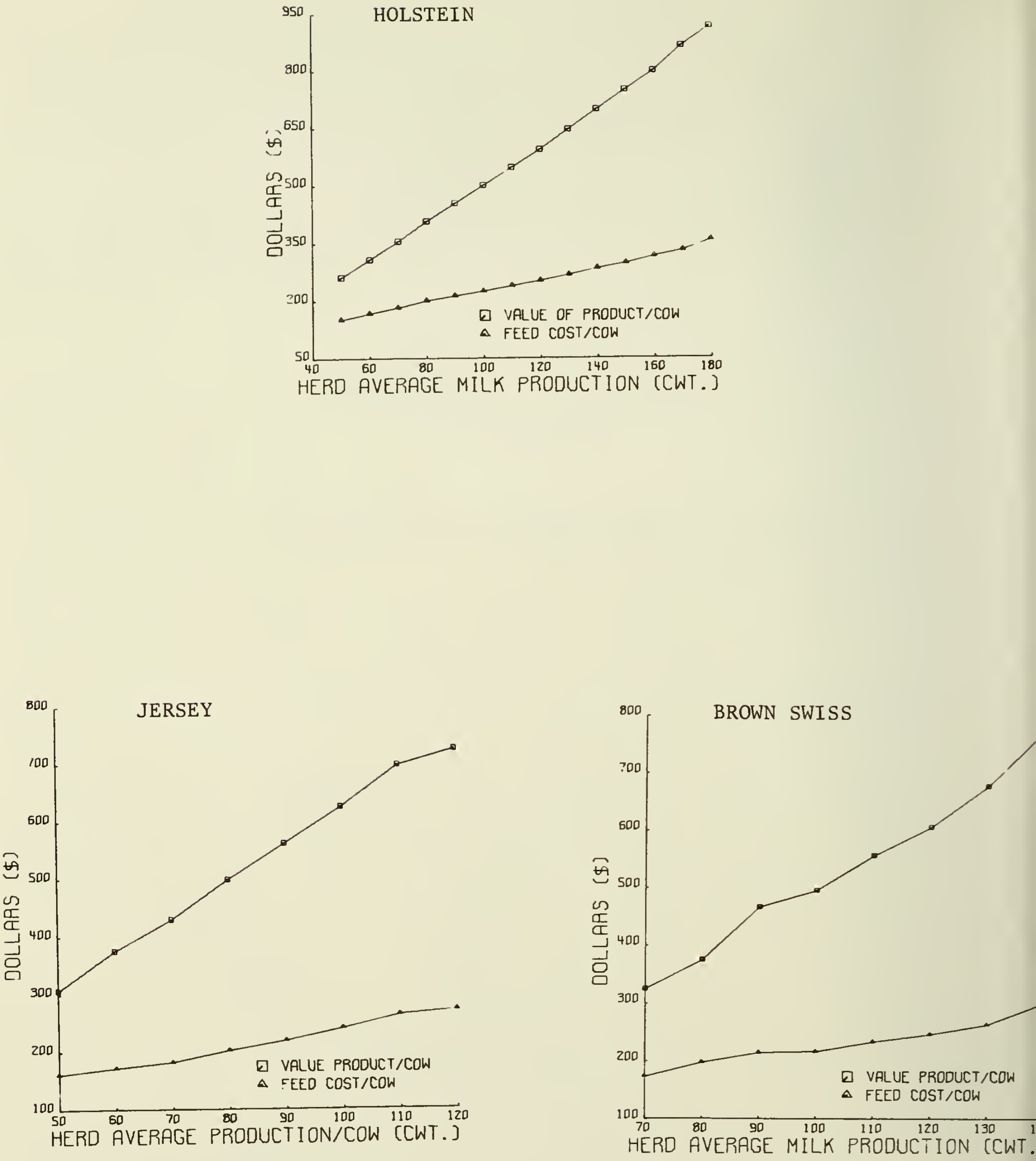

Figure 3.--Value of product and feed cost by level of production for herds in
Standard DHIA recordkeeping plan: Holstein, Jersey, and Brown Swiss

TABLE 1.--Summary of production for cows in DHIA Standard recordkeeping plan and for all other cows

Year 2/	Standard plan DHIA cows							All other cows 1/			Superiority of Std. plan DHIA cows	
	Herds	Cows	Cows per herd	Percent of all cows 3/	Milk	Fat	Fat	Milk	Fat	Fat	Milk	Fat
	Number	Number	Number	Percent	Pounds	Percent	Pounds	Pounds	Percent	Pounds	Pounds	Pounds
1930---	27,888	507,549	18.2	2.3	7,642	3.96	303	4,435	3.92	174	3,207	129
1940---	27,948	676,141	24.2	2.9	8,133	4.07	331	4,519	3.96	179	3,614	152
1950---	40,100	1,088,872	27.2	4.9	9,172	4.03	370	5,113	3.95	202	4,059	168
1961---	42,558	1,867,469	43.9	10.6	10,796	3.87	418	4/6,550	4/3.74	4/245	4,246	173
1962---	42,034	1,958,355	46.6	11.3	11,032	3.86	426	6,739	3.72	251	4,293	175
1963---	41,937	2,006,534	47.8	11.8	11,286	3.85	434	6,872	3.71	255	4,414	179
1964---	40,670	2,010,144	49.4	12.2	11,685	3.83	447	6,990	3.69	258	4,695	189
1965---	40,075	2,087,581	52.1	13.0	11,976	3.82	457	7,268	3.67	267	4,708	190
1966---	38,879	2,058,592	52.9	13.3	12,127	3.81	462	7,459	3.67	274	4,668	188
1967---	37,683	2,098,919	55.7	14.9	12,307	3.80	468	7,851	3.67	288	4,456	180

1/ Derived from U.S. cow population and production figures, excluding heifers not fresh as estimated by USDA's Statistical Reporting Service. Also includes cows on the Owner-Sampler and Weigh-a-Day-a-Month recordkeeping plans.

2/ The year for which the Standard January 1 enrollment is given.

3/ Calculated using U.S. calendar year cow numbers for year previous to stated year; for example: January 1, 1967, DHIA enrollment of 2,098,919 cows is 14.9 percent of the 1966 U.S. total of 14,123,000 cows.

4/ Comparison began to be made between DHIA production for the testing year ending May 14 of the stated year and U.S. production for the previous calendar year.

ABLE 2.--A 10-year summary of DHIA cow-year averages for herds reporting complete information

ar	Herds	Cows	Cows per herd	Milk	Fat	Fat	Conc. fed	Succ. forage fed	Dry forage fed	Value of product	Cost of conc.	Feed cost	Income over feed cost
	Number	Number	Number	Lb.	Pct.	Lb.	Cwt.	Cwt.	Cwt.	Dol.	Dol.	Dol.	Dol.
57-58-------	27,525	900,269	32.7	9,787	3.91	383	31	69	40	462	92	190	272
58-59-------	27,796	902,074	32.5	10,042	3.89	391	33	75	40	475	93	195	280
59-60 1/----	23,220	795,892	34.3	10,045	3.89	391	33	76	40	479	93	196	283
60-61-------	18,644	689,710	37.0	10,048	3.88	390	32	78	39	485	94	198	287
61-62-------	22,853	882,827	38.6	10,676	3.87	413	36	82	40	502	103	207	295
62-63-------	27,093	1,089,290	40.2	10,983	3.85	423	39	92	40	501	113	222	279
63-64-------	27,893	1,173,099	42.1	11,428	3.84	439	42	98	38	521	120	237	284
64-65-------	28,237	1,229,676	43.5	11,744	3.82	449	44	102	38	539	127	244	295
65-66-------	28,013	1,260,621	45.0	11,885	3.81	453	45	108	36	559	133	256	303
66-67-------	27,483	1,282,357	46.7	12,030	3.82	459	47	113	36	631	143	265	366
-year change: 2/ gross ------------			+14.0	+2,243	-0.09	+76	+16	+44	-4	+169	+51	+75	+94
percentage -------			+42.8	+22.9	-2.3	+19.8	+51.6	+63.8	-10.0	+36.6	+55.4	+39.5	+34.6

1/ Average of 1958-59 and 1960-61 because of change in testing year.
2/ During this period, the hundredweight price of milk changed +53 cents gross and +11.5 percent.

TABLE 3.--Summary of 1966-67 Standard plan DHIA cow-year production, by States 1/

State	Herd records	Cow-years 2/	Cows per herd	Cow-year average production		
				Milk	Fat	Fat
	Number	Number	Number	Pounds	Percent	Pounds
Alabama--------------	263	23,925	91.0	9,676	3.9	376
Alaska---------------	3	132	44.0	12,227	3.7	453
Arizona--------------	92	16,424	178.5	12,898	3.6	470
Arkansas-------------	68	3,306	48.6	11,361	3.7	416
California-----------	1,736	333,404	192.1	13,278	3.8	502
Colorado-------------	184	12,818	69.7	12,728	3.7	469
Connecticut----------	388	21,492	55.4	12,754	3.9	497
Delaware-------------	82	4,100	50.0	11,764	3.9	456
Florida--------------	110	17,861	162.4	9,653	3.9	377
Georgia--------------	345	26,932	78.1	11,053	3.8	425
Hawaii---------------	9	2,130	236.7	11,482	3.3	378
Idaho----------------	533	22,993	43.1	12,358	3.8	472
Illinois-------------	1,314	53,079	40.4	12,175	3.8	466
Indiana--------------	990	39,602	40.0	12,235	3.9	476
Iowa-----------------	1,566	55,269	35.3	11,740	3.8	442
Kansas---------------	718	32,904	45.8	12,409	3.7	463
Kentucky-------------	429	18,691	43.6	11,081	3.8	424
Louisiana------------	62	5,686	91.7	8,954	3.9	346
Maine----------------	381	17,170	45.1	12,078	3.9	476
Maryland-------------	634	36,717	57.9	11,751	3.9	463
Massachusetts--------	412	19,208	46.6	12,307	4.0	490
Michigan-------------	1,691	73,018	43.2	12,673	3.7	471
Minnesota------------	3,056	102,154	33.4	11,892	3.8	446
Mississippi----------	201	14,754	73.4	9,172	4.0	368
Missouri-------------	436	21,743	49.9	11,961	3.8	455
Montana--------------	50	2,556	51.1	12,979	3.6	466
Nebraska-------------	334	14,756	44.2	11,987	3.7	447
Nevada---------------	26	2,809	108.0	11,784	3.8	448
New Hampshire--------	249	11,944	48.0	12,024	4.0	478
New Jersey-----------	388	22,420	57.8	12,877	3.8	492
New Mexico-----------	24	3,888	162.0	12,628	3.6	452
New York-------------	3,424	172,374	50.3	13,009	3.7	482
North Carolina-------	677	41,768	61.7	11,957	3.8	452
North Dakota---------	128	4,665	36.4	11,381	3.8	427
Ohio-----------------	1,994	83,231	41.7	12,178	3.8	467
Oklahoma-------------	195	11,997	61.5	11,737	3.6	424
Oregon---------------	370	23,371	63.2	11,717	4.1	478
Pennsylvania---------	4,205	163,622	38.9	12,524	3.9	488
Rhode Island---------	44	2,153	48.9	11,637	3.9	450
South Carolina-------	236	21,989	93.2	10,507	4.0	425
South Dakota---------	141	5,603	39.7	12,235	3.7	449
Tennessee------------	458	26,580	58.0	10,491	4.0	417
Texas----------------	257	23,911	93.0	10,866	3.7	403
Utah-----------------	362	18,095	50.0	12,992	3.7	479
Vermont--------------	734	37,150	50.6	11,661	3.9	456
Virginia-------------	854	52,536	61.5	12,020	3.8	455
Washington-----------	534	34,276	64.2	12,890	3.9	499
West Virginia--------	156	7,245	46.4	11,317	3.8	434
Wisconsin------------	2,948	124,170	42.1	12,309	3.8	469
Wyoming--------------	24	1,408	58.7	11,992	3.5	420
Total or average----------	34,515	1,890,024	54.8	12,307	3.8	468

1/ Includes all production data reported.
2/ Rounded to the nearest cow-year.

TABLE 4 .--Summary of 1966-67 Standard plan DHIA records, by States 1/

State	Herds	Body weight	Cow-year 2/	Milk	Fat	Fat	Days in milk 3/	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	Dol.	Dol.	Dol.	Dol.	Dol.
Alabama---------	262	11	23,878	9,680	3.9	376	83	48	59	13	565	167	257	308	2.65
Arkansas--------	67	11	3,205	11,408	3.7	417	84	45	37	37	609	145	270	339	2.36
Connecticut-----	388	12	21,492	12,754	3.9	497	85	55	158	27	784	206	346	438	2.72
Delaware--------	82	12	4,100	11,764	3.9	456	85	43	149	19	687	144	285	402	2.42
Florida---------	105	10	16,845	9,609	3.9	377	84	51	59	24	645	167	272	373	2.83
Georgia---------	338	11	26,376	11,012	3.9	425	84	47	98	14	683	165	285	398	2.59
Hawaii----------	9	13	2,130	11,482	3.3	378	79	52	60	66	875	247	470	405	4.10
Idaho-----------	20	12	758	12,452	3.6	453	86	33	47	106	455	86	226	229	1.82
Illinois--------	1,294	12	52,290	12,163	3.8	466	85	43	91	39	586	113	213	373	1.75
Indiana---------	990	12	39,602	12,235	3.9	476	85	44	117	36	624	119	236	388	1.93
Iowa------------	1,554	12	54,103	11,749	3.8	443	85	49	105	41	531	123	217	314	1.84
Kansas----------	709	12	32,057	12,404	3.7	463	85	53	111	45	611	150	261	350	2.10
Kentucky--------	427	12	18,613	11,088	3.8	424	84	41	83	25	582	130	240	342	2.17
Louisiana-------	61	10	5,603	9,026	3.9	348	81	41	62	15	570	137	240	330	2.66
Maine-----------	381	12	17,170	12,078	3.9	476	85	48	88	44	707	181	302	405	2.50
Maryland--------	628	13	35,998	11,706	3.9	462	85	47	147	25	676	154	313	363	2.67
Massachusetts---	412	12	19,208	12,307	4.0	490	84	52	129	36	785	190	341	444	2.77
Michigan--------	1,682	12	72,294	12,684	3.7	471	87	45	102	46	563	106	214	349	1.68
Minnesota-------	3,045	12	101,821	11,896	3.7	446	85	47	108	46	496	99	189	307	1.59
Mississippi-----	201	10	14,754	9,172	4.0	368	83	38	95	8	535	128	211	324	2.30
Missouri--------	416	12	19,790	11,941	3.8	454	86	46	77	39	601	136	250	351	2.10
Nebraska--------	321	13	14,033	11,938	3.7	445	85	46	106	48	564	128	231	333	1.94
New Hampshire---	249	12	11,944	12,024	4.0	478	85	46	128	39	716	170	317	399	2.64
New Jersey------	388	13	22,420	12,877	3.8	492	85	52	152	34	733	177	347	386	2.70
New York--------	3,424	12	172,374	13,009	3.7	482	85	45	128	40	679	158	287	392	2.21
North Carolina--	668	12	41,123	11,944	3.8	452	85	50	171	11	746	180	314	432	2.63
North Dakota----	128	13	4,665	11,381	3.8	427	84	44	99	50	499	96	185	314	1.62
Ohio------------	1,994	12	83,231	12,178	3.8	467	86	45	122	39	637	122	249	388	2.05
Oklahoma--------	188	12	11,085	11,895	3.6	425	83	50	45	63	612	140	267	345	2.24
Oregon----------	4	11	233	10,886	4.2	452	86	27	35	66	574	104	256	318	2.35
Pennsylvania----	4,182	12	162,688	12,527	3.9	488	86	49	116	39	639	154	292	347	2.33
Rhode Island----	44	13	2,153	11,637	3.9	450	83	46	150	32	749	173	356	393	3.06
South Carolina--	236	11	21,989	10,507	4.0	425	84	44	121	17	656	150	276	380	2.62
South Dakota----	140	13	5,523	12,262	3.7	450	84	47	112	52	563	115	232	331	1.89
Tennessee-------	454	11	26,344	10,487	4.0	418	84	40	112	20	616	135	261	355	2.49
Texas-----------	255	11	23,832	10,859	3.7	403	83	49	57	42	639	147	270	369	2.49
Vermont---------	733	11	37,114	11,663	3.9	456	84	41	88	42	649	157	283	366	2.43
Virginia--------	851	12	52,446	12,026	3.8	455	85	47	147	18	711	167	306	405	2.54
West Virginia---	153	12	7,077	11,312	3.8	433	85	42	101	29	622	144	270	352	2.39
Total or average-----	27,483	12	1,282,357	12,030	3.8	459	85	47	113	36	631	143	265	366	2.20
Total or average from table 3------	34,515	--	1,890,024	12,307	3.8	468	--	--	---	--	---	---	---	---	----

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1/ Cow-year basis, based on complete individual herd reports.

2/ Rounded to the nearest cow-year.

3/ Days in milk is the ratio of the number of days in the year cows were milked as compared to the number of days cows were actually present in the herd; the ratio is expressed as a percentage.

TABLE 5.--Summary of 1966-67 Standard plan DHIA yearly herd averages, stratified by levels of butterfat production [1]

Butterfat production-pounds	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk[2]	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	Dol.	Dol.	Dol.	Dol.	Dol.
Under 225---	47	11	51.8	5,238	3.8	199	72	25	52	25	279	80	166	113	3.23
225-274-----	180	11	56.9	6,640	3.9	256	77	30	64	29	345	88	177	168	2.69
275-324-----	684	11	51.9	7,866	3.9	305	80	34	73	32	406	102	198	208	2.54
325-374-----	2,242	11	50.5	9,145	3.9	354	82	38	81	35	473	114	216	257	2.39
375-424-----	4,924	12	48.1	10,523	3.8	403	84	42	92	38	533	122	232	301	2.22
425-474-----	7,215	12	47.2	11,815	3.8	450	85	46	103	39	597	135	251	346	2.14
475-524-----	6,822	12	44.7	13,089	3.8	498	86	49	110	40	664	149	272	392	2.09
525-574-----	3,867	12	45.0	14,307	3.8	546	87	53	116	41	734	164	294	440	2.07
575-624-----	1,219	13	43.0	15,425	3.9	594	87	57	120	42	808	179	316	492	2.06
625-674-----	241	13	42.9	16,648	3.9	641	87	61	123	43	877	198	340	537	2.05
725-UP------	42	13	36.6	17,954	3.9	703	89	67	110	52	956	228	384	572	2.15
Total or average--	27,483	12	46.7	12,099	3.8	462	85	47	103	39	617	140	258	359	2.16

[1] All groupings and the total or average line are on a herd basis.

[2] Days in milk is the ratio of the number of days in the year cows were milked as compared to the number of days cows were actually present in the herd; the ratio is expressed as a percentage.

TABLE 6.--Summary of 1966-67 Standard plan DHIA yearly herd averages, stratified by days in milk [1]

Days in milk-percent	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk[2]	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	Dol.	Dol.	Dol.	Dol.	Dol.
No Report--	1	12	4.6	15,674	3.8	602	--	63	--	96	639	178	265	374	1.69
Under 63---	13	11	41.2	5,473	4.1	222	58	29	53	31	275	90	181	94	3.54
63 - 67----	34	11	48.8	7,046	4.1	287	66	33	52	34	372	94	190	182	2.78
68 - 72----	139	11	59.0	7,992	3.9	315	71	36	72	33	423	109	211	212	2.70
73 - 77----	642	12	47.2	9,352	3.8	360	76	40	78	37	473	116	221	252	2.40
78 - 82----	4,357	12	46.8	11,044	3.8	419	81	44	93	39	563	134	248	315	2.28
83 - 87----	16,203	12	47.2	12,270	3.8	468	85	47	105	39	627	143	262	365	2.16
88 - 92----	5,936	12	45.1	12,821	3.9	494	89	48	108	39	650	141	260	390	2.06
93 - UP----	158	12	37.0	13,118	3.8	505	94	50	99	39	657	141	253	404	2.00
Total or average-	27,483	12	46.7	12,099	3.8	462	85	47	103	39	617	140	258	359	2.16

[1] All groupings and the total or average line are on a herd basis.

[2] Days in milk is the ratio of the number of days in the year cows were milked as compared to the number of days cows were actually present in the herd; the ratio is expressed as a percentage.

TABLE 7.--Summary of 1966-67 Standard plan DHIA yearly herd averages, stratified by levels of concentrates fed [1]

Concentrates fed-hundredweight	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk[2]	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	Dol.	Dol.	Dol.	Dol.	Dol.
05 - 14-----	26	11	51.5	8,356	4.0	334	83	11	108	37	408	39	152	256	1.89
15 - 24-----	391	11	46.5	8,585	4.1	354	82	22	76	38	446	66	172	274	2.09
25 - 34-----	3,349	11	47.5	9,866	4.1	400	84	31	91	37	519	93	202	317	2.11
35 - 44-----	8,400	12	46.8	11,423	3.9	443	85	40	103	38	585	120	236	349	2.11
45 - 54-----	8,977	12	46.8	12,649	3.8	477	85	49	108	40	640	148	269	371	2.15
55 - 64-----	4,566	12	45.0	13,481	3.7	502	86	59	105	40	679	176	298	381	2.23
65 - 74-----	1,373	13	47.6	13,989	3.7	518	86	68	100	40	710	204	323	387	2.33
75 - 84-----	326	12	47.6	14,139	3.7	523	86	78	94	38	732	234	346	386	2.48
85 - UP-----	75	13	50.3	14,357	3.7	533	86	90	79	40	771	276	388	383	2.73
Total or average--	27,483	12	46.7	12,099	3.8	462	85	47	103	39	617	140	258	359	2.16

[1] All groupings and the total or average line are on a herd basis.

[2] Days in milk is the ratio of the number of days in the year cows were milked as compared to the number of days cows were actually present in the herd; the ratio is expressed as a percentage.

TABLE 8.--Summary of 1966-67 Standard plan DHIA yearly herd averages by breed, stratified by levels of milk production [1]

Milk production-pounds	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk[2]	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	Dol.	Dol.	Dol.	Dol.	Dol.
AYRSHIRE															
Under 7,500---	14	11	40.8	6,633	4.1	270	78	33	61	33	344	95	177	167	2.65
7,500- 8,499---	27	11	38.0	8,110	4.0	325	79	33	64	43	427	106	215	212	2.66
8,500- 9,499---	106	11	40.6	9,057	4.0	364	82	37	73	39	480	118	224	256	2.47
9,500-10,499---	112	11	37.7	9,988	4.0	404	83	39	85	40	538	124	234	304	2.34
10,500-11,499---	115	11	45.4	10,991	4.1	447	84	44	90	40	608	143	262	346	2.39
11,500-12,499---	64	12	44.4	11,956	4.0	483	85	47	93	38	655	156	269	386	2.25
12,500-13,499---	25	11	41.5	12,887	4.0	513	85	46	85	42	703	163	279	424	2.17
13,500-UP-------	10	12	26.2	14,303	4.0	577	86	56	69	41	792	199	315	477	2.20
Total or average------	473	11	41.2	10,327	4.0	417	83	41	82	40	560	133	245	315	2.39
GUERNSEY															
Under 6,500---	47	10	59.9	5,899	4.8	281	80	27	72	28	347	83	172	175	2.93
6,500- 7,499---	138	10	47.6	7,083	4.8	338	82	33	81	30	424	99	195	229	2.76
7,500- 8,499---	346	10	47.1	8,013	4.8	383	84	35	75	33	473	103	200	273	2.50
8,500- 9,499---	535	10	45.8	9,020	4.8	433	86	39	80	34	536	115	217	319	2.41
9,500-10,499---	467	11	43.8	9,986	4.8	478	86	41	79	37	595	125	233	362	2.34
10,500-11,499---	235	11	42.6	10,913	4.8	521	87	45	83	36	653	142	255	398	2.33
11,500-12,499---	72	11	45.3	11,864	4.7	557	88	49	74	38	709	153	266	443	2.24
12.500-UP-------	24	11	39.0	13,065	4.5	586	88	53	102	37	751	159	274	477	2.10
Total or average------	1,864	10	45.5	9,254	4.8	442	85	39	79	34	550	119	223	327	2.43
HOLSTEIN															
Under 6,500---	32	12	51.1	5,649	3.7	207	76	26	49	25	292	76	162	129	2.91
6,500- 7,499---	81	12	47.3	7,065	3.7	260	78	31	73	30	355	90	184	171	2.61
7,500- 8,499---	228	12	51.5	8,041	3.7	296	79	35	82	32	407	101	201	206	2.50
8,500- 9,499---	588	12	49.8	9,098	3.7	337	82	37	91	35	454	107	214	240	2.35
9,500-10,499---	1,320	12	49.1	10,056	3.7	370	83	40	97	36	500	117	225	275	2.24
10,500-11,499---	2,741	12	48.7	11,052	3.7	407	84	43	104	38	546	125	239	307	2.17
11,500-12,499---	4,179	12	47.3	12,024	3.7	442	85	46	109	40	593	134	252	341	2.10
12,500-13,499---	4,670	12	46.6	12,997	3.7	479	85	49	113	41	645	146	268	377	2.06
13,500-14,499---	4,034	13	46.3	13,966	3.7	515	86	52	116	42	698	156	284	414	2.03
14,500-15,499---	2,300	13	44.6	14,935	3.7	550	87	54	116	42	749	167	297	452	1.99
15,500-16,499---	941	13	42.7	15,912	3.7	582	87	58	114	45	799	181	316	483	1.99
16,500-17,499---	276	13	43.5	16,902	3.6	616	87	61	114	45	865	195	331	534	1.96
17,500-18,499---	68	13	41.3	17,884	3.6	646	89	64	108	47	904	213	356	548	1.99
18,500-UP-------	24	13	39.9	18,913	3.7	692	89	67	103	52	950	221	367	584	1.93
Total or average------	21,482	12	46.8	12,775	3.7	470	85	48	110	40	636	144	266	370	2.09

See footnotes at end of table.

TABLE 8.--Summary of 1966-67 Standard plan DHIA yearly herd averages by breed, stratified by levels of milk production [1]--Continued

Milk production-pounds	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk[2]	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	Dol.	Dol.	Dol.	Dol.	Dol.
JERSEY															
Under 5,500----	25	9	62.2	5,011	5.0	249	74	28	38	26	307	82	162	144	3.28
5,500- 6,499----	77	9	50.1	6,116	5.2	315	79	29	46	25	376	92	173	203	2.84
6,500- 7,499----	273	9	49.7	7,059	5.2	364	83	34	48	29	430	102	183	247	2.59
7,500- 8,499----	439	9	52.3	8,020	5.1	410	85	36	59	28	499	113	203	296	2.54
8,500- 9,499----	421	9	47.2	8,978	5.1	462	86	39	63	31	562	124	220	342	2.45
9,500-10,499----	169	9	49.3	9,930	5.1	506	87	44	70	31	625	145	241	384	2.42
10,500-11,499----	60	9	51.7	10,864	5.0	540	86	46	67	29	697	162	264	433	2.43
11,500-UP--------	17	10	43.2	12,071	4.6	560	88	47	94	32	725	158	272	453	2.26
Total or average-------	1,481	9	50.0	8,345	5.1	426	85	37	59	29	519	119	209	310	2.53
BROWN SWISS															
Under 7,500----	17	12	29.7	6,838	4.0	274	76	34	71	40	325	83	174	152	2.61
7,500- 8,499----	26	12	29.2	8,046	4.1	331	82	36	78	46	376	95	199	177	2.48
8,500- 9,499----	61	13	33.6	9,015	4.1	371	82	39	79	38	468	113	216	252	2.40
9,500-10,499----	106	13	36.9	10,034	4.1	412	85	42	89	43	497	113	218	279	2.17
10,500-11,499----	134	13	36.5	11,005	4.1	453	85	46	90	44	558	127	235	323	2.14
11,500-12,499----	128	13	32.5	11,952	4.1	494	86	49	89	47	608	135	248	360	2.08
12,500-13,499----	66	13	32.0	12,944	4.1	536	87	51	92	47	680	145	265	415	2.04
13,500-UP--------	33	13	33.8	14,200	4.1	589	87	55	102	47	777	172	302	475	2.13
Total or average-------	571	13	34.2	10,975	4.1	453	85	45	88	44	560	127	237	323	2.18
MILKING SHORTHORN															
Under 7,500----	14	12	27.0	6,383	3.7	239	76	30	61	41	294	77	161	133	2.60
7,500- 8,499----	30	12	22.9	8,071	3.8	305	80	34	50	39	355	84	173	182	2.15
8,500- 9,499----	25	12	24.3	9,045	3.7	339	81	33	54	42	406	88	178	228	1.97
9,500-UP--------	24	12	29.9	10,852	3.7	403	84	38	78	38	496	100	193	303	1.78
Total or average-------	93	12	25.7	8,797	3.7	329	81	34	60	39	396	88	178	218	2.07
MIXED BREEDS															
Under 6,500----	27	10	68.2	5,805	4.2	243	73	29	47	23	324	90	167	156	2.89
6,500- 7,499----	48	10	54.8	7,026	4.3	299	80	33	52	25	410	104	196	214	2.78
7,500- 8,499----	128	10	57.5	8,072	4.2	342	82	38	56	27	470	122	221	249	2.74
8,500- 9,499----	189	11	59.4	9,030	4.1	374	84	40	73	31	503	127	235	268	2.61
9,500-10,499----	249	11	53.4	10,029	4.1	408	85	42	78	32	553	133	245	308	2.45
10,500-11,499----	271	11	50.6	11,028	3.9	433	85	45	93	34	589	141	262	327	2.37
11,500-12,499----	252	11	48.4	11,991	3.9	469	86	48	102	35	627	149	275	352	2.29
12,500-13,499----	186	11	41.4	12,955	3.9	499	86	51	99	39	659	161	290	369	2.24
13,500-14,499----	106	11	39.5	13,899	3.8	533	86	53	112	39	700	167	307	393	2.21
14,500-15,499----	43	11	38.1	14,981	3.8	563	88	59	127	40	763	188	328	435	2.19
15,500-UP--------	16	11	35.0	15,963	3.7	594	88	64	107	44	799	200	344	455	2.16
Total or average-------	1,515	11	50.4	10,907	4.0	433	85	45	88	34	582	142	260	322	2.42

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[1] All groupings and the total or average line are on a herd basis.

[2] Days in milk is the ratio of the number of days in the year cows were milked as compared to the number of days cows were actually present in the herd; the ratio is expressed as a percentage.

TABLE 9.--Levels of milk production at or below which dairy profits are not expected in the United States

Breed	Milk level	Standard plan DHIA herds that do not exceed milk level	
	Pounds	Number	Percent
Ayrshire --------------------	8,100	41	8.7
Guernsey --------------------	5,900	47	2.5
Holstein --------------------	7,100	113	.5
Jersey ----------------------	5,000	25	1.7
Brown Swiss -----------------	6,800	17	3.0
Milking Shorthorn 1/ ---------	6,400	14	1/15.1

1/ Only 93 Milking Shorthorn herds represented.

TABLE 10.--Summary of 1966-67 Owner-Sampler DHIA cow-year production, by States [1/]

State	Herd records	Cow-years [2/]	Cows per herd	Cow-year average production		
				Milk	Fat	Fat
	Number	Number	Number	Pounds	Percent	Pounds
Alabama--------------	5	319	63.8	9,429	3.6	340
Alaska---------------	4	152	38.0	11,356	3.5	398
Arkansas-------------	47	1,900	40.4	10,258	3.7	382
California-----------	132	5,608	42.5	10,747	4.2	454
Colorado-------------	18	991	55.1	11,184	3.6	401
Connecticut----------	65	2,899	44.6	12,627	3.8	481
Delaware-------------	11	273	24.8	11,405	3.9	440
Florida--------------	2	1,343	671.5	9,222	4.0	366
Georgia--------------	5	360	72.0	11,569	3.6	422
Idaho----------------	16	394	24.6	11,640	4.0	461
Illinois-------------	305	9,719	31.9	11,652	3.7	435
Indiana--------------	74	2,493	33.7	12,467	3.8	473
Iowa-----------------	985	25,719	26.1	11,263	3.7	417
Kansas---------------	98	3,243	33.1	11,732	3.7	432
Kentucky-------------	31	1,240	40.0	10,570	3.7	388
Louisiana------------	3	166	55.3	11,445	3.2	369
Maine----------------	82	3,186	38.9	11,625	3.8	447
Maryland-------------	68	2,821	41.5	11,053	3.9	431
Massachusetts--------	62	2,134	34.4	11,501	3.9	449
Michigan-------------	1,261	41,006	32.5	12,249	3.7	451
Minnesota------------	1,631	43,849	26.9	11,136	3.7	410
Mississippi----------	1	74	74.0	5,842	4.8	283
Missouri-------------	86	2,449	28.5	10,515	3.8	398
Montana--------------	31	2,000	64.5	11,806	3.6	428
Nebraska-------------	78	2,536	32.5	11,534	3.5	409
Nevada---------------	1	1,044	1044.0	15,953	2.9	456
New Hampshire--------	38	1,399	36.8	11,029	4.0	438
New Jersey-----------	33	1,621	49.1	12,042	3.8	455
New York-------------	2,083	78,631	37.7	12,203	3.6	445
North Carolina-------	30	1,255	41.8	11,839	3.7	439
North Dakota---------	18	470	26.1	10,311	3.6	375
Ohio-----------------	342	10,583	30.9	11,510	3.8	433
Oklahoma-------------	26	1,356	52.2	11,294	3.6	406
Oregon---------------	70	1,997	28.5	10,376	4.5	463
Pennsylvania---------	1,117	33,783	30.2	11,785	3.8	453
South Carolina-------	1	51	51.0	9,542	4.3	406
South Dakota---------	103	3,358	32.6	11,580	3.6	413
Tennessee------------	4	160	40.0	8,981	3.8	343
Texas----------------	13	725	55.8	10,572	3.8	404
Utah-----------------	24	843	35.1	12,295	3.7	452
Vermont--------------	261	9,985	38.3	10,452	4.0	415
Virginia-------------	51	1,836	36.0	12,487	3.6	451
Washington-----------	36	971	27.0	11,838	4.1	483
West Virginia--------	20	712	35.6	10,592	4.0	426
Wisconsin------------	8,533	267,905	31.4	11,508	3.7	429
Wyoming--------------	7	257	36.7	10,490	3.5	369
Total or average-----------	17,912	575,816	32.1	11,607	3.7	432

[1/] Includes all production data reported.
[2/] Rounded to the nearest cow-year.

TABLE 11.--Summary of 1966-67 Owner-Sampler DHIA records, by States [1]

State	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk[2]	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	Dol.	Dol.	Dol.	Dol.	Dol.
Alabama---------	5	11	319	9,429	3.6	340	85	52	50	23	544	171	257	287	2.72
Arkansas--------	46	11	1,782	10,339	3.7	387	84	44	32	31	541	142	238	303	2.31
Connecticut-----	65	12	2,899	12,627	3.8	481	84	54	133	29	763	205	333	430	2.63
Delaware--------	11	11	273	11,405	3.9	440	82	38	137	13	632	123	256	376	2.25
Florida---------	2	11	1,343	9,222	4.0	366	83	42	112	20	624	166	272	352	2.95
Georgia---------	5	12	360	11,569	3.6	422	83	44	132	5	653	160	276	377	2.38
Illinois--------	175	12	5,424	11,711	3.7	437	83	44	72	46	533	104	197	336	1.68
Indiana---------	74	12	2,493	12,467	3.8	473	85	44	119	36	617	118	232	385	1.86
Iowa------------	979	12	25,415	11,269	3.7	418	83	45	81	44	473	110	199	274	1.76
Kansas----------	96	12	3,115	11,747	3.7	434	84	50	108	41	550	142	241	309	2.05
Kentucky--------	31	11	1,240	10,570	3.7	388	83	40	95	26	526	126	249	277	2.35
Louisiana-------	3	11	166	11,445	3.2	369	84	55	8	23	690	184	283	407	2.48
Maine-----------	82	12	3,186	11,625	3.8	447	84	41	96	38	655	154	273	382	2.34
Maryland--------	68	12	2,821	11,053	3.9	431	85	44	124	25	621	144	286	335	2.58
Massachusetts---	62	12	2,134	11,501	3.9	449	84	45	110	38	727	171	318	409	2.76
Minnesota-------	1,617	12	43,429	11,145	3.7	410	83	44	97	47	447	91	180	267	1.62
Mississippi-----	1	9	74	5,842	4.8	283	80	40	--	23	360	128	190	170	3.25
Missouri--------	85	11	2,387	10,565	3.8	400	84	46	53	36	506	136	236	270	2.24
Nebraska--------	77	12	2,485	11,513	3.6	409	83	43	84	46	471	112	201	270	1.74
New Hampshire---	38	11	1,399	11,029	4.0	438	84	43	87	49	649	163	299	350	2.71
New Jersey------	33	12	1,621	12,042	3.8	455	85	43	169	28	682	145	305	377	2.53
New York--------	2,083	12	78,631	12,203	3.6	445	84	41	106	44	621	145	266	355	2.18
North Carolina--	30	12	1,255	11,839	3.7	439	85	50	151	14	730	176	308	422	2.60
North Dakota----	17	12	438	10,247	3.6	371	80	43	56	54	409	88	159	250	1.55
Ohio------------	342	12	10,583	11,510	3.8	433	85	43	104	40	588	117	232	356	2.02
Oklahoma--------	26	11	1,356	11,294	3.6	406	82	44	28	61	574	124	247	327	2.19
Pennsylvania----	1,114	11	33,650	11,790	3.8	453	84	45	103	42	581	142	278	303	2.35
South Carolina--	1	10	51	9,542	4.3	406	86	43	66	18	553	140	220	333	2.31
South Dakota----	101	12	3,163	11,558	3.6	414	84	44	104	45	501	107	206	295	1.78
Tennessee-------	4	11	160	8,981	3.8	343	82	36	102	17	511	112	226	285	2.52
Texas-----------	13	11	725	10,572	3.8	404	84	52	27	41	629	174	286	343	2.70
Vermont---------	182	11	7,047	10,695	3.9	421	83	38	62	46	601	145	265	336	2.47
Virginia--------	51	12	1,836	12,487	3.6	451	85	48	112	21	679	171	303	376	2.43
West Virginia---	18	11	683	10,648	4.0	428	85	41	103	24	605	143	273	332	2.57
Total or average------	7,537	12	243,943	11,645	3.7	433	84	43	98	43	563	130	242	321	2.08
Total or average from table 10-----	17,912	--	575,816	11,607	3.7	432	--	--	---	--	---	---	---	---	----

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[1] Cow-year basis, based on complete individual herd reports only.

[2] Days in milk is the ratio of the number of days in the year cows were milked as compared to the number of days cows were actually present in the herd; the ratio is expressed as a percentage.

TABLE 12.--Summary of 1966-67 Owner-Sampler DHIA yearly herd averages, stratified by levels of butterfat production [1]

Butterfat production-pounds	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk[2]	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	Dol.	Dol.	Dol.	Dol.	Dol.
Under 225---	14	10	24.1	4,984	3.9	193	76	22	42	43	216	54	133	83	2.65
225-274-----	71	11	27.1	6,921	3.7	255	76	28	53	45	302	76	163	139	2.37
275-324-----	383	11	29.1	8,202	3.7	306	80	33	70	44	362	88	182	180	2.23
325-374-----	968	11	31.7	9,454	3.7	353	82	36	76	44	430	101	198	232	2.11
375-424-----	1,961	12	32.6	10,799	3.7	401	83	41	85	45	500	116	220	280	2.05
425-474-----	2,167	12	32.7	12,033	3.7	449	84	45	91	45	569	132	242	327	2.02
475-524-----	1,406	12	33.6	13,309	3.7	496	85	49	98	44	645	149	266	379	2.01
525-574-----	454	12	31.7	14,449	3.8	544	86	52	104	45	717	164	290	427	2.01
575-624-----	95	12	31.7	15,393	3.8	589	86	55	92	46	785	183	306	479	1.99
625-UP------	18	13	24.9	16,367	4.0	660	86	61	89	46	838	196	320	518	1.96
Total or average--	7,537	12	32.4	11,561	3.7	432	84	44	88	45	546	127	235	311	2.05

[1] All groupings and the total or average line are on a herd basis.

[2] Days in milk is the ratio of the number of days in the year cows were milked as compared to the number of days cows were actually present in the herd; the ratio is expressed as a percentage.

TABLE 13.--Summary of 1966-67 Owner-Sampler DHIA yearly herd averages, stratified by days in milk [1]

Days in milk-percent	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk[2]	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	Dol.	Dol.	Dol.	Dol.	Dol.
No Report---	1	12	1.6	12,563	3.8	481	--	38	--	58	475	119	200	275	1.59
Under 68----	23	11	29.2	7,362	3.9	285	64	32	65	45	333	84	174	158	2.40
68 - 72-----	65	12	24.9	8,641	3.8	325	70	34	61	47	372	84	172	200	2.04
73 - 77-----	347	12	28.4	9,715	3.7	359	76	38	74	46	433	106	203	230	2.11
78 - 82-----	1,864	12	31.9	10,970	3.7	407	81	42	84	45	510	120	226	284	2.07
83 - 87-----	4,305	12	33.5	11,879	3.7	444	85	44	91	44	567	131	242	325	2.05
88 - 92-----	909	12	30.4	12,274	3.8	463	89	46	90	44	580	131	239	341	1.96
93 - UP-----	23	12	22.1	11,990	3.8	455	94	47	66	45	567	133	237	330	2.00
Total or average--	7,537	12	32.4	11,561	3.7	432	84	44	88	45	546	127	235	311	2.05

[1] All groupings and the total or average line are on a herd basis.

[2] Days in milk is the ratio of the number of days in the year cows were milked as compared to the number of days cows were actually present in the herd; the ratio is expressed as a percentage.

TABLE 14.--Summary of 1966-67 Owner-Sampler DHIA yearly herd averages, stratified by levels of concentrates fed [1]

Concentrates fed-hundredweight	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk[2]	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	Dol.	Dol.	Dol.	Dol.	Dol.
No Report---	1	12	15.5	10,695	3.7	396	83	--	112	76	560	---	226	334	2.11
Under 15----	27	11	27.0	8,606	3.8	331	82	9	52	39	368	28	113	255	1.50
15 - 24-----	209	11	30.3	8,911	3.8	342	81	21	78	45	418	64	165	253	1.89
25 - 34-----	1,297	11	33.0	10,054	3.8	384	83	30	88	45	485	92	199	286	2.01
35 - 44-----	2,669	12	33.7	11,300	3.7	423	84	40	91	44	536	118	227	309	2.03
45 - 54-----	2,160	12	32.1	12,276	3.7	455	84	49	90	45	579	142	252	327	2.07
55 - 64-----	884	12	30.2	12,927	3.7	475	85	59	83	45	600	164	272	328	2.12
65 - 74-----	235	12	28.0	13,434	3.7	491	85	68	79	45	612	183	287	325	2.15
75 - 84-----	45	12	29.1	13,324	3.6	484	85	78	70	49	609	213	319	290	2.42
85 - UP-----	10	12	27.4	13,347	3.6	482	86	90	40	49	606	242	327	279	2.48
Total or average--	7,537	12	32.4	11,561	3.7	432	84	44	88	45	546	127	235	311	2.05

[1] All groupings and the total or average line are on a herd basis.

[2] Days in milk is the ratio of the number of days in the year cows were milked as compared to the number of days cows were actually present in the herd; the ratio is expressed as a percentage.

TABLE 15.--Summary of 1966-67 Owner-Sampler DHIA yearly herd averages by breed, stratified by levels of milk production [1]

Milk production-pounds	Herds	Body weight	Cow-years	Milk	Fat	Fat	Days in milk[2]	Concentrates fed	Succ. forage fed	Dry forage fed	Value of product	Cost of concentrates	Feed cost	Income over feed cost	Feed cost per cwt. milk
	Number	Cwt.	Number	Lb.	Pct.	Lb.	Pct.	Cwt.	Cwt.	Cwt.	Dol.	Dol.	Dol.	Dol.	Dol.
AYRSHIRE															
Under 8,500----	15	10	27.5	7,819	4.1	317	77	34	59	42	410	113	206	203	2.64
8,500- 9,499----	21	11	24.4	9,041	4.0	362	82	35	58	44	440	112	206	234	2.28
9,500-10,499----	9	11	34.6	9,906	4.0	395	82	36	42	49	539	124	224	315	2.26
10,500-UP--------	20	11	31.1	11,307	4.0	453	85	41	90	37	593	140	240	353	2.13
Total or average-------	65	11	28.6	9,576	4.0	384	82	37	66	42	494	123	219	275	2.32
GUERNSEY															
Under 7,500----	50	10	24.2	6,975	4.7	328	81	28	50	47	355	78	167	188	2.41
7,500- 8,499----	74	10	31.8	8,041	4.7	380	84	35	61	41	425	96	182	243	2.27
8,500- 9,499----	86	10	29.0	9,029	4.6	418	85	37	60	42	473	105	199	274	2.21
9,500-10,499----	46	10	26.1	9,955	4.5	449	85	39	63	40	520	112	202	318	2.03
10,500-11,499----	25	11	33.8	11,078	4.3	476	86	44	76	41	598	139	242	356	2.19
11,500-UP--------	11	11	30.5	12,453	4.1	508	86	50	90	36	661	168	277	384	2.24
Total or average-------	292	10	28.9	8,877	4.6	406	84	37	62	42	466	104	197	269	2.23
HOLSTEIN															
Under 6,500----	13	11	29.7	5,883	3.7	219	74	28	38	44	265	67	147	118	2.49
6,500- 7,499----	49	11	27.0	7,121	3.7	265	76	27	54	46	311	74	158	153	2.22
7,500- 8,499----	128	11	30.0	8,059	3.7	295	80	32	79	44	354	84	180	174	2.24
8,500- 9,499----	355	12	30.3	9,073	3.6	331	81	35	80	44	400	94	192	208	2.11
9,500-10,499----	686	12	33.0	10,066	3.7	369	82	38	84	45	450	102	201	249	2.00
10,500-11,499----	1,245	12	33.2	11,048	3.7	404	83	42	91	45	508	117	222	286	2.01
11,500-12,499----	1,372	12	33.5	12,009	3.6	438	84	45	95	46	558	128	239	319	1.99
12,500-13,499----	1,216	12	33.9	12,987	3.6	474	85	48	96	45	616	141	256	360	1.97
13,500-14,499----	736	12	34.3	13,941	3.6	507	85	50	100	45	668	153	271	397	1.94
14,500-15,499----	286	13	32.5	14,911	3.6	542	86	54	98	47	718	170	291	427	1.95
15,500-16,499----	82	13	32.1	15,902	3.6	575	86	57	88	47	767	182	296	471	1.86
16,500-UP--------	21	13	30.7	17,135	3.6	620	86	60	87	54	840	201	335	506	1.96
Total or average-------	6,189	12	33.2	11,923	3.6	435	84	44	92	45	556	128	237	319	2.00
JERSEY															
Under 6,500----	29	9	32.6	5,986	5.1	305	80	28	50	34	342	79	156	186	2.60
6,500- 7,499----	42	9	27.5	7,028	5.0	352	82	32	41	36	384	100	177	207	2.52
7,500- 8,499----	66	9	29.8	7,960	5.1	402	84	34	51	35	473	110	196	277	2.45
8,500- 9,499----	56	9	31.0	8,948	5.0	444	85	37	47	41	536	125	215	321	2.40
9,500-10,499----	24	9	30.3	9,921	4.7	469	86	43	48	38	584	143	233	351	2.35
10,500-UP--------	11	11	36.4	11,563	4.6	532	86	47	90	37	689	165	272	417	2.35
Total or average-------	228	9	30.4	8,160	5.0	404	84	35	49	37	477	114	199	278	2.46
BROWN SWISS															
Under 8,500----	16	12	20.6	7,598	4.0	306	79	33	63	48	336	80	170	166	2.24
8,500- 9,499----	20	12	27.3	8,993	4.1	366	83	36	53	48	416	104	196	220	2.18
9,500-10,499----	14	12	21.6	10,163	4.1	412	84	44	74	56	463	110	211	252	2.08
10,500-11,499----	14	13	22.6	10,984	4.0	437	84	42	88	46	512	108	213	299	1.94
11,500-UP--------	23	12	23.9	12,505	4.0	495	86	48	63	47	575	128	225	350	1.80
Total or average-------	87	12	23.5	10,174	4.0	408	83	41	67	49	466	107	204	262	2.04
MILKING SHORTHORN															
Under 10,500----	7	12	22.7	8,973	3.8	341	83	33	64	44	389	86	173	216	1.95
10,500-UP--------	4	11	10.0	11,453	3.8	433	65	43	18	52	440	114	180	260	1.57
Total or average-------	11	12	18.1	9,874	3.8	374	84	36	47	47	408	96	176	232	1.81
MIXED BREEDS															
Under 6,500----	15	10	22.3	5,417	4.3	235	77	27	43	34	234	76	149	85	2.73
6,500- 7,499----	20	10	22.5	7,062	4.2	296	80	32	35	43	325	98	187	138	2.65
7,500- 8,499----	39	11	25.3	8,024	4.2	340	81	34	53	39	392	97	194	198	2.42
8,500- 9,499----	64	11	27.0	8,953	4.1	367	82	37	59	41	430	108	207	223	2.32
9,500-10,499----	122	11	28.9	10,018	4.0	397	84	40	74	41	498	123	238	260	2.37
10,500-11,499----	132	11	29.3	11,000	3.9	427	85	43	81	41	530	135	251	279	2.28
11,500-12,499----	119	11	31.2	11,949	3.9	462	85	47	99	42	586	144	270	316	2.26
12,500-13,499----	91	11	30.8	12,971	3.8	493	85	51	96	45	632	157	290	342	2.24
13,500-14,499----	47	11	28.8	13,904	3.8	527	85	55	93	44	679	165	300	379	2.16
14,500-UP--------	15	11	27.5	15,115	3.8	568	86	57	110	43	733	178	320	414	2.12
Total or average-------	664	11	28.9	10,941	3.9	428	84	44	80	42	533	133	251	282	2.31

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[1] All groupings and the total or average line are on a herd basis.

[2] Days in milk is the ratio of the number of days in the year cows were milked as compared to the number of days cows were actually present in the herd; the ratio is expressed as a percentage.

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National Cooperative Dairy Herd Improvement Program
RECORD BOOK
A plan for every size herd
STANDARD DHIA
OWNER SAMPLER
WEIGH-A-DAY-A-MONTH
AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

ARS-44-201
Dairy-Herd-Improvement Letter
(Vol. 44, No. 1)

March 1968

DHIA PARTICIPATION REPORT [1/]
January 1, 1968

The National Cooperative Dairy Herd Improvement Program is a composite of the Standard (including DHIR), Owner-Sampler, and Weigh-a-Day-a-Month recordkeeping plans. On January 1, 1968, the Program included 62,879 herds consisting of 3,028,267 cows on test, which is 22.4 percent of the nation's dairy cow population. These figures represent an increase of 1.3 percent of cows on test, an increase of 50,792 cows, and a decrease of 1,244 herds during the year. Table 1 presents these data and also includes 4,284 herds and 139,672 cows on other testing programs such as Vocational Agriculture, commercial, private, etc.

Each of the 50 States and Puerto Rico are represented in the total program that includes 1,318 associations and 2,304 supervisors. The participation reports for all testing programs and for the Standard, Owner-Sampler, and Weigh-a-Day-a-Month plans are shown in tables 1, 2, 3, and 4, respectively.

On January 1, 1968, 814 fewer herds and 33,010 more cows were on Standard test than in the previous year. Average

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[1/] Prepared by F. N. Dickinson, B. T. McDaniel, C. A. Rampendahl, and J. J. Corbin from data supplied by the State Extension Dairymen in Charge of DHIA Testing.

Issued May 1968

herd size was 57.8 cows, an increase of 2.1 cows per herd over the previous year. Milk production of Standard DHIA cows has increased consistently since 1956 at a rate of 259 pounds per year. Milk fat has slightly but steadily declined at an average annual rate of 0.014 percent per year since 1956. The changes in milk production and milk fat are partly a reflection of a change in breed proportions. Herd size and the percentage of milk fat agree closely with the estimates for all U.S. dairy cows.

On January 1, 1968, 296 fewer herds and 22,358 more cows were on the Owner-Sampler test than in the previous year. Average herd size was 33.7 cows. Wisconsin had 43.9 percent of the Owner-Sampler enrollment. The Weigh-a-Day-a-Month plan had 867 herds consisting of 48,853 cows. Average herd size for this plan was 56.3 cows.

Electronic data processing at State and regional DHIA centers continues to advance as shown in table 5. Electronic processing of Standard plan records (including DHIR) has reached 100 percent in 39 States. In the United States, it includes 95.2 percent of the herds and 85.4 percent of the cows on Standard DHIA. The corresponding values for records of the three plans combined are 89.9 and 84.0 percent, respectively.

In 1967, approximately 99.9 percent of the lactation records reported to USDA were centrally processed. The benefits to be derived from centrally processed DHIA herdbooks and records have been thoroughly demonstrated during the last 10 years. It is hoped that dairymen who have not converted to the improved system will do so soon.

The present status and changes since 1906 in Standard DHIA enrollment are shown in table 6. The number of cows in the program has about doubled since 1950, although the number of herds tested continues to decrease.

Table 7 is a 12-year summary of the production of Standard DHIA and all U.S. dairy cows. Table 8 shows that the proportion of cows participating in the total DHIA program increased from 9.3 percent in 1956 to 22.4 percent in 1967.

A list of the 231 counties that have 40 percent or more of their dairy cows on one or more of the recordkeeping plans is shown in table 9. Twenty percent of the counties have 25 percent or more of their dairy cattle enrolled in one or more recordkeeping plans.

On the last page is an updated list of Extension Dairymen in charge of production testing from information supplied by each State.

LACTATION RECORDS REPORTED IN 1967

In 1967, 1,851,274 Standard DHIA lactation records were reported to USDA for use in statistical summaries, genetic appraisals, and research. This is 62,300 more than were reported in 1966. Of these, 72.5 percent were reported on magnetic tape and 27.4 percent on punched cards. A very small number of records were reported on hand-coded forms. The records reported by State are summarized in table 10.

Since 1958, the number of cows enrolled in Standard DHIA has increased 36 percent, while the number of lactation records reported to the USDA has increased 135 percent. As a result, the proportion of cows on test having reported records has increased from 51 to 88 percent since 1958. This more complete reporting is attributed largely to the continued development of central processing of Standard DHIA records. A 10-year summary of the records reported since 1958 is shown in table 11.

LACTATION RECORD REJECTS

About 6.7 percent of the lactation records submitted in 1967 were rejected because the editing procedure revealed they contained invalid, conflicting, or questionable data. The U.S. Department of Agriculture was able to adjust or reconcile approximately 13,500 additional records that conflicted with previous reports or with breed association registration files.

The types and frequencies of discrepancies that were noted in the preliminary screening of lactation records are shown in table 12. The major problem is the lack of identification on sires and dams of registered cows. In 1,800 records the breed codes of cows with registration numbers were different from those of their sires or dams. Over 800 records on registered cows had a sire number coded as grade. Attention to following the uniform eartag series numbers or to reporting all identification on registered cows will greatly reduce the number of records that are screened for such errors as those above. It will also reduce the effort made by farmers, DHIA, and Dairy Records Processing Centers to correct these mistakes. Another major problem was blanks in the records.

Reasons for rejecting records in the main USDA edit and the number of records so affected are shown in table 13. Over 100,000 records were rejected, the main problems being birth dates, invalid characters (usually alphabetics), conflicting calving dates, and sire or dam numbers. A substantial portion of the rejected records had errors in more than one field because more than 125,000 error conditions were recognized. The material in table 13 is based only on registered cows or grade cows for which sires were reported. Thus, it appears that the error rate in records identified by sire is near 10 percent, because a substantial number of lactation records continue to be reported without sire identification.

You may note that several tables show error conditions. This results because records are edited for all remaining fields after the first conflict is found. The fact that error conditions exceed the number of rejected records indicates that many records continue to have more than one error.

SIRES SUMMARIZED IN 1967

DHIA sire summaries were computed on a total of 38,103 bulls in 1967 (table 14). Of these, 31,670 represent a resummary of bulls in USDA-DHIA master files prior to 1967. Bulls in this category were summarized in 1967 because sire summary procedures were revised and improved that year. More than 6,000 bulls born in recent years or available in AI were summarized in the May and September runs, and the data have been distributed to the industry.

In January 1968, 6,726 bulls were summarized, primarily with data received in 1967. These summaries have been made available to the industry.

DHIA COWS INDEXED IN 1967

DHIA Cow Index evaluations on 7,211 outstanding cows—registered progeny of bulls summarized in 1967—were computed and made available to the dairy industry for consideration as dams of future herd sires.

Screening was based on the production superiority that these cows are expected to transmit to their offspring. Cows meeting either of the two minimum standards—one based strictly on milk yield and the other on a combination of milk and fat yields—were included. Cows qualifying by breed for these two standards are shown in table 15. These animals comprise approximately the highest 2 percent of the breed.

TABLE 1.--The National Cooperative Dairy Herd Improvement Program and other testing programs (January 1, 1968)

State	Counties	Asso-ciations	Super-visors	Standard		Owner-Sampler		Weigh-a-Day-a-Month		Total		Milk cows in U.S.	
				Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Total 1/	In all plans
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Thousands	Percent
Ala------	50	23	24	329	32,105	6	487	13	931	348	33,523	150	22.3
Alaska---	2	1	2	5	196	4	135	--	-----	9	331	1.9	17.4
Ariz-----	5	4	10	78	14,305	20	7,003	--	-----	98	21,308	51	41.8
Ark------	25	11	17	81	4,375	99	3,160	10	400	190	7,935	108	7.3
Calif----	44	30	118	1,841	371,229	150	14,070	--	-----	1,991	385,299	781	49.3
Colo-----	18	15	20	231	19,269	31	1,522	--	-----	262	20,791	98	21.2
Conn-----	8	7	24	389	22,677	58	2,609	6	449	453	25,735	69	37.3
Del------	3	3	5	81	4,236	10	253	3	56	94	4,545	16	28.4
Fla------	32	10	12	124	21,078	4	1,980	16	4,318	144	27,376	182	15.0
Ga-------	100	31	30	378	31,118	8	562	58	6,546	444	38,226	144	26.5
Hawaii---	3	1	1	17	4,322	2	645	--	-----	19	4,967	14.4	34.5
Idaho----	31	33	33	545	22,488	16	482	--	-----	561	22,970	156	14.7
Ill------	83	53	81	1,364	58,034	367	11,829	209	6,941	1,940	76,804	358	21.5
Ind------	81	59	71	1,026	43,759	306	13,956	--	-----	1,332	57,715	270	21.4
Iowa-----	97	74	109	1,687	60,756	1,369	36,402	3	45	3,059	97,203	617	15.8
Kans-----	92	57	58	792	38,162	135	4,416	20	552	947	43,130	221	19.5
Ky-------	70	36	44	524	23,497	40	1,483	39	1,508	603	26,488	380	7.0
La-------	35	19	21	86	8,356	5	301	197	13,062	288	21,719	188	11.6
Maine----	16	13	25	394	18,782	94	3,682	--	-----	488	22,464	72	31.2
Md-------	20	17	34	650	41,714	74	3,275	--	-----	724	44,989	174	25.9
Mass-----	11	11	21	426	20,030	69	2,483	--	-----	495	22,513	74	30.4
Mich-----	79	55	107	1,618	78,058	1,424	49,095	--	-----	3,042	127,153	495	25.7
Minn-----	84	80	210	3,391	119,023	2,258	63,577	--	-----	5,649	182,600	1,094	16.7
Miss-----	51	20	26	281	21,888	5	492	22	1,327	308	23,707	222	10.7
Mo-------	75	45	46	501	26,212	181	5,859	--	-----	682	32,071	397	8.1
Mont-----	15	6	8	72	4,316	29	2,542	--	-----	101	6,858	49	14.0
Nebr-----	58	31	33	396	18,796	86	3,200	43	950	525	22,946	224	10.2
Nev------	6	2	3	62	6,380	2	1,145	--	-----	64	7,525	13.5	55.7
N. H-----	10	9	17	256	13,014	62	2,559	6	327	324	15,900	42	37.9
N. J-----	12	9	24	393	23,992	38	3,771	--	-----	431	27,763	86	32.3
N. Mex---	13	4	6	31	6,916	4	1,773	--	-----	35	8,689	38	22.9
N. Y-----	49	49	170	3,758	186,511	2,558	94,798	--	-----	6,316	281,309	1,069	26.3
N. C-----	86	40	52	769	49,901	38	1,529	57	2,943	864	54,373	200	27.2
N. Dak---	38	13	11	144	5,902	30	760	25	642	199	7,304	173	4.2
Ohio-----	85	80	142	2,117	90,978	1,372	41,418	--	-----	3,489	132,396	498	26.6
Okla-----	52	16	20	271	17,010	57	2,996	2	70	330	20,076	159	12.6
Oreg-----	25	15	23	325	24,195	107	4,430	--	-----	432	28,625	117	2 .5
Pa-------	67	61	186	4,247	178,203	1,321	39,855	--	-----	5,568	218,058	742	29.4
P. R-----	6	1	1	6	820	--	-----	18	3,534	24	4,354	---	----
R. I-----	4	2	3	46	2,230	--	-----	--	-----	46	2,230	8.8	25.3
S. C-----	36	14	25	259	26,391	2	112	8	262	269	26,765	75	35.7
S. Dak---	60	20	19	141	5,604	385	10,100	--	-----	526	15,704	210	7.5
Tenn-----	59	42	37	503	31,011	6	231	35	1,314	544	32,556	348	9.4
Tex------	77	25	29	344	32,476	26	1,563	8	796	378	34,835	384	9.1
Utah-----	18	15	16	408	21,107	27	1,040	--	-----	435	22,147	76	29.1
Vt-------	13	28	56	734	39,121	611	26,693	1	50	1,346	65,864	216	30.5
Va-------	80	40	54	972	62,956	58	2,385	12	496	1,042	65,837	241	27.3
Wash-----	32	22	44	569	37,248	39	1,208	--	-----	608	38,456	195	19.7
W. Va----	29	11	17	157	8,367	30	1,053	56	1,334	243	10,754	73	14.7
Wis------	70	50	154	3,010	131,243	11,502	371,852	--	-----	14,512	503,095	1,933	26.0
Wyo------	7	5	5	40	1,572	18	714	--	-----	58	2,286	20.5	11.2
Total or percent: The Natl. Coop.DHI Program	2,122	1,318	2,304	36,869	2,131,929	25,143	847,485	867	48,853	62,879	3,028,267	13,524	22.4
All testing programs 2/--	-----	-----	------	---------	------	-------	---	------		67,163	3,167,939	------	23.4

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

2/ The following number of herds and cows are on other testing programs such as Vocational-Agriculture, commercial, private, etc., by State: Arizona, 40 herds, 8,000 cows; California, 41 herds, 4,197 cows; Colorado, 36 herds, 2,954 cows; Connecticut, 17 herds, 1,900 cows; Iowa, 300 herds, 5,000 cows; Michigan, 227 herds, 8,078 cows; New Mexico, 14 herds, 1,225 cows; North Dakota, 45 herds, 889 cows; Washington, 12 herds, 1,089 cows; Wisconsin, 3,549 herds, 106,188 cows; Wyoming, 3 herds, 152 cows. Total = 4,284 herds, 139,672 cows.

TABLE 2.--Standard DHIA recordkeeping in the United States (January 1, 1968)

State	Counties	Herds	Cows	Change from 1-1-67	Av. cows per herd	All milk cows 1/	DHIA cows as pct. of all milk cows 2/	Change from 1-1-67
	Number	Number	Number	Number	Number	Thousands	Percent	Percent
Ala----------	49	329	32,105	+1,284	97.6	150	21.4	+1.9
Alaska-------	2	5	196	+31	39.2	1.9	10.3	+2.0
Ariz---------	5	78	14,305	-2,239	183.4	51	28.0	-3.8
Ark----------	14	81	4,375	+575	54.0	108	4.1	+.8
Calif--------	44	1,841	371,229	+8,777	201.6	781	47.5	+.6
Colo---------	15	231	19,269	+5,016	83.4	98	19.7	+5.3
Conn---------	8	389	22,677	-1	58.3	69	32.9	+.5
Del----------	3	81	4,236	-225	52.3	16	26.5	+.3
Fla----------	31	124	21,078	+989	170.0	182	11.6	+.4
Ga-----------	87	378	31,118	+2	82.3	144	21.6	+.9
Hawaii-------	1	17	4,322	-158	254.2	14.4	30.0	+.1
Idaho--------	31	545	22,488	-8,227	41.3	156	14.4	-4.6
Ill----------	80	1,364	58,034	-3,318	42.5	358	16.2	+.4
Ind----------	81	1,026	43,759	+617	42.7	270	16.2	+1.9
Iowa---------	96	1,687	60,756	+1,286	36.0	617	9.8	+.7
Kans---------	90	792	38,162	+2,834	48.2	221	17.3	+1.8
Ky-----------	51	524	23,497	+1,449	44.8	380	6.2	+.6
La-----------	22	86	8,356	+872	97.2	188	4.4	+.6
Maine--------	16	394	18,782	+929	47.7	72	26.1	+2.0
Md-----------	20	650	41,714	+1,592	64.2	174	24.0	+1.7
Mass---------	11	426	20,030	-1,134	47.0	74	27.1	-1.5
Mich---------	79	1,618	78,058	-3,283	48.2	495	15.8	+.8
Minn---------	84	3,391	119,023	-3,218	35.1	1,094	10.9	+.2
Miss---------	48	281	21,888	+3,190	77.9	222	9.9	+2.2
Mo-----------	68	501	26,212	+2,201	52.3	397	6.6	+.9
Mont---------	12	72	4,316	+938	59.9	49	8.8	+2.4
Nebr---------	55	396	18,796	+2,100	47.5	224	8.4	+1.4
Nev----------	6	62	6,380	-66	102.9	13.5	47.3	+2.3
N. H---------	10	256	13,014	+682	50.8	42	31.0	+.9
N. J---------	12	393	23,992	-1,243	61.0	86	27.9	+1.9
N. Mex-------	9	31	6,916	+672	223.1	38	18.2	+1.8
N. Y---------	49	3,758	186,511	+4,753	49.6	1,069	17.4	+1.0
N. C---------	81	769	49,901	+2,232	64.9	200	25.0	+2.3
N. Dak-------	33	144	5,902	-198	41.0	173	3.4	+.3
Ohio---------	84	2,117	90,978	+122	43.0	498	18.3	+.9
Okla---------	49	271	17,010	+2,847	62.8	159	10.7	+2.3
Oreg---------	25	325	24,195	-2,105	74.4	117	20.7	-.9
Pa-----------	67	4,247	178,203	-1,529	42.0	742	24.0	+.6
P. R---------	6	6	820	-73	136.7	---	----	----
R. I---------	4	46	2,230	+38	48.5	8.8	25.3	+3.4
S. C---------	34	259	26,391	+1,511	101.9	75	35.2	+2.9
S. Dak-------	28	141	5,604	-1,046	39.7	210	2.7	-.4
Tenn---------	55	503	31,011	+582	61.7	348	8.9	+.7
Tex----------	71	344	32,476	+3,426	94.4	384	8.5	+1.3
Utah---------	18	408	21,107	+789	51.7	76	27.8	+1.4
Vt-----------	13	734	39,121	+57	53.3	216	18.1	-.1
Va-----------	78	972	62,956	+3,891	64.8	241	26.1	+2.5
Wash---------	32	569	37,248	+188	65.5	195	19.1	+.5
W. Va--------	18	157	8,367	-424	53.3	73	11.5	+.4
Wis----------	70	3,010	131,243	+4,881	43.6	1,933	6.8	+.4
Wyo----------	7	40	1,572	+144	39.3	20.5	7.7	+1.2
Total, average, or percent---	1,962	36,869	2,131,929	+33,010	57.8	13,524	15.8	+.9

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

2/ Percentage of cows included in the Standard (including DHIR) recordkeeping plan.

TABLE 3.--Owner-Sampler recordkeeping in the United States (January 1, 1968)

State	Counties	Herds	Cows	Change from 1-1-67	Av. cows per herd	All milk cows 1/	O.S. cows as pct. of all milk cows 2/	Change from 1-1-67
	Number	Number	Number	Number	Number	Thousands	Percent	Percent
Ala----------	5	6	487	+187	81.2	150	0.3	+.1
Alaska-------	1	4	135	-15	33.8	1.9	7.1	-.4
Ariz---------	1	20	7,003	+7,003	350.2	51	13.7	+13.7
Ark----------	25	99	3,160	+460	31.9	108	2.9	+.6
Calif--------	19	150	14,070	+5,184	93.8	781	1.8	+.6
Colo---------	8	31	1,522	+792	49.1	98	1.6	+.9
Conn---------	8	58	2,609	-693	45.0	69	3.8	-.9
Del----------	2	10	253	+7	25.3	16	1.6	+.2
Fla----------	3	4	1,980	-88	495.0	182	1.1	-.1
Ga-----------	3	8	562	+177	70.3	144	.4	+.1
Hawaii-------	2	2	645	+619	322.5	14.4	4.5	+4.3
Idaho--------	12	16	482	-119	30.1	156	.3	-.1
Ill----------	25	367	11,829	-1,386	32.2	358	3.3	-.1
Ind----------	17	306	13,956	-15,599	45.6	270	5.2	-4.6
Iowa---------	88	1,369	36,402	-643	26.6	617	5.9	+.3
Kans---------	29	135	4,416	+440	32.7	221	2.0	+.3
Ky-----------	20	40	1,483	-92	37.1	380	.4	0
La-----------	4	5	301	-250	60.2	188	.2	-.1
Maine--------	12	94	3,682	-76	39.2	72	5.1	0
Md-----------	8	74	3,275	+110	44.3	174	1.9	+.1
Mass---------	8	69	2,483	-172	36.0	74	3.4	-.2
Mich---------	72	1,424	49,095	+20	34.5	495	9.9	+.9
Minn---------	81	2,258	63,577	-1,013	28.2	1,094	5.8	+.2
Miss---------	5	5	492	+421	98.4	222	.2	+.2
Mo-----------	25	181	5,859	+1,694	32.4	397	1.5	+.5
Mont---------	8	29	2,542	+866	87.7	49	5.2	+2.0
Nebr---------	20	86	3,200	+384	37.2	224	1.4	+.2
Nev----------	2	2	1,145	+10	572.5	13.5	8.5	-.2
N. H---------	9	62	2,559	+349	41.3	42	6.1	+.7
N. J---------	7	38	3,771	+1,918	99.2	86	4.4	+2.5
N. Mex-------	2	4	1,773	+160	443.3	38	4.7	+.5
N. Y---------	49	2,558	94,798	-1,025	37.1	1,069	8.9	+.3
N. C---------	15	38	1,529	+50	40.2	200	.8	+.1
N. Dak-------	12	30	760	-60	25.3	173	.4	0
Ohio---------	81	1,372	41,418	+418	30.2	498	8.3	+.5
Okla---------	25	57	2,996	+639	52.6	159	1.9	+.5
Oreg---------	19	107	4,430	+830	41.4	117	3.8	+.8
Pa-----------	60	1,321	39,855	+547	30.2	742	5.4	+.3
P. R---------	--	---	-----	----	----	---	---	---
R. I---------	--	---	-----	----	----	8.8	---	---
S. C---------	2	2	112	-84	56.0	75	.1	-.2
S. Dak-------	60	385	10,100	-1,500	26.2	210	4.8	-.6
Tenn---------	4	6	231	+5	38.5	348	.1	0
Tex----------	13	26	1,563	+447	60.1	384	.4	+.1
Utah---------	3	27	1,040	+6	38.5	76	1.4	+.1
Vt-----------	13	611	26,693	-971	43.7	216	12.4	-.5
Va-----------	14	58	2,385	+239	41.1	241	1.0	+.1
Wash---------	11	39	1,208	+19	31.0	195	.6	0
W. Va--------	8	30	1,053	+246	35.1	73	1.4	+.4
Wis----------	70	11,502	371,852	+22,305	32.3	1,933	19.2	+1.6
Wyo----------	3	18	714	-408	39.7	20.5	3.5	-1.6
Total, average, or percent---	993	25,143	847,485	+22,358	33.7	13,524	6.3	+.5

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

2/ Percentage of cows included in the Owner-Sampler recordkeeping plan.

TABLE 4.--Weigh-a-Day-a-Month recordkeeping in the United States (January 1, 1968)

State	Counties	Herds	Cows	Change from 1-1-67	Av. cows per herd	All milk cows 1/	WADAM cows as pct. of all milk cows 2/	Change from 1-1-67
	Number	Number	Number	Number	Number	Thousands	Percent	Percent
Ala----------	8	13	931	-315	71.6	150	0.6	-.2
Alaska-------	--	--	---	----	----	1.9	---	---
Ariz---------	--	--	---	----	----	51	---	---
Ark----------	4	10	400	-100	40.0	108	.4	0
Calif--------	--	--	---	----	----	781	---	---
Colo---------	--	--	---	----	----	98	---	---
Conn---------	2	6	449	+449	74.8	69	.7	+.7
Del----------	1	3	56	+2	18.7	16	.4	+.1
Fla----------	8	16	4,318	-1,040	269.9	182	2.4	-.6
Ga-----------	21	58	6,546	+1,708	112.9	144	4.5	+1.3
Hawaii-------	--	--	---	----	----	14.4	---	---
Idaho--------	--	--	---	----	----	156	---	---
Ill----------	39	209	6,941	-1,210	33.2	358	1.9	-.2
Ind----------	--	--	---	----	----	270	---	---
Iowa---------	2	3	45	+45	15.0	617	---	---
Kans---------	10	20	552	+252	27.6	221	.2	+.1
Ky-----------	19	39	1,508	-575	38.7	380	.4	-.1
La-----------	26	197	13,062	+232	66.3	188	6.9	+.4
Maine--------	--	--	---	-33	----	72	---	---
Md-----------	--	--	---	----	----	174	---	---
Mass---------	--	--	---	----	----	74	---	---
Mich---------	--	--	---	----	----	495	---	---
Minn---------	--	--	---	----	----	1,094	---	---
Miss---------	8	22	1,327	-1,173	60.3	222	.6	-.4
Mo-----------	--	--	---	----	----	397	---	---
Mont---------	--	--	---	----	----	49	---	---
Nebr---------	17	43	950	+4	22.1	224	.4	0
Nev----------	--	--	---	----	----	13.5	---	---
N. H---------	1	6	327	-41	54.5	42	.8	-.1
N. J---------	--	--	---	----	----	86	---	---
N. Mex-------	--	--	---	-1,404	----	38	---	-3.7
N. Y---------	--	--	---	----	----	1,069	---	---
N. C---------	28	57	2,943	-390	51.6	200	1.5	-.1
N. Dak-------	12	25	642	+69	25.7	173	.4	+.1
Ohio---------	--	--	---	----	----	498	---	---
Okla---------	2	2	70	-53	35.0	159	---	-.1
Oreg---------	--	--	---	----	----	117	---	---
Pa-----------	--	--	---	----	----	742	---	---
P. R---------	6	18	3,534	-905	196.3	---	---	---
R. I---------	--	--	---	----	----	8.8	---	---
S. C---------	4	8	262	-402	32.8	75	.3	-.6
S. Dak-------	--	--	---	----	----	210	---	---
Tenn---------	20	35	1,314	+101	37.5	348	.4	+.1
Tex----------	4	8	796	+156	99.5	384	.2	0
Utah---------	--	--	---	----	----	76	---	---
Vt-----------	1	1	50	+50	50.0	216	---	---
Va-----------	6	12	496	+137	41.3	241	.2	+.1
Wash---------	--	--	---	----	----	195	---	---
W. Va--------	17	56	1,334	-140	23.8	73	1.8	-.1
Wis----------	--	--	---	----	----	1,933	---	---
Wyo----------	--	--	---	----	----	20.5	---	---
Total, average, or percent---	266	867	48,853	-4,576	56.3	13,524	.4	0

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

2/ Percentage of cows included in the Weigh-a-Day-a-Month recordkeeping plan.

TABLE 5.--Herds and cows enrolled in State and regional computing centers (January 1, 1968)

State	Standard DHIA (Incl. DHIR)				Dairy Herd Improvement Registry		Owner-Sampler		Total machine processing 1/		Machine-processing as percent of total recordkeeping 1/	
	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows
	Number	Number	Pct. 2/	Pct. 2/	Number	Number	Number	Number	Number	Number	Pct.	Pct.
Ala-------	329	32,105	100.0	100.0	15	1,648	6	487	343	33,099	98.6	98.7
Alaska----	5	196	100.0	100.0	3	101	4	135	9	331	100.0	100.0
Ariz------	47	8,090	60.3	56.6	17	2,960	--	---	47	8,090	48.0	38.0
Ark-------	81	4,375	100.0	100.0	11	475	99	3,160	180	7,535	94.7	95.0
Calif-----	296	76,900	16.1	20.7	101	21,619	3	1,884	299	78,784	15.0	20.4
Colo------	231	19,269	100.0	100.0	34	2,218	31	1,522	262	20,791	100.0	100.0
Conn------	389	22,677	100.0	100.0	72	4,674	58	2,609	453	25,735	100.0	100.0
Del-------	81	4,236	100.0	100.0	10	655	10	253	91	4,489	96.8	98.8
Fla-------	124	21,078	100.0	100.0	12	1,479	4	1,980	128	23,058	88.9	84.2
Ga--------	378	31,118	100.0	100.0	33	3,395	8	562	419	36,476	94.4	95.4
Hawaii----	15	4,035	88.2	93.4	--	-----	2	645	17	4,680	89.5	94.2
Idaho-----	507	21,094	93.0	93.8	34	1,323	16	482	523	21,576	93.2	93.9
Ill-------	1,364	58,034	100.0	100.0	147	6,592	238	7,959	1,717	70,114	88.5	91.3
Ind-------	1,026	43,759	100.0	100.0	179	6,949	86	2,962	1,112	46,721	83.5	81.0
Iowa------	1,687	60,756	100.0	100.0	223	8,041	1,257	33,159	2,944	93,915	96.2	96.6
Kans------	792	38,162	100.0	100.0	126	5,142	135	4,416	927	42,578	97.9	98.7
Ky--------	524	23,497	100.0	100.0	47	1,880	40	1,483	603	26,488	100.0	100.0
La--------	82	7,778	95.3	93.1	12	1,113	5	301	284	21,141	98.6	97.3
Maine-----	394	18,782	100.0	100.0	60	3,215	94	3,682	488	22,464	100.0	100.0
Md--------	650	41,714	100.0	100.0	102	7,733	74	3,275	724	44,989	100.0	100.0
Mass------	426	20,030	100.0	100.0	88	4,333	64	2,351	490	22,381	99.0	99.4
Mich------	1,618	78,058	100.0	100.0	165	9,795	1,313	45,997	2,931	124,055	96.4	97.6
Minn------	3,326	116,908	98.1	98.2	178	7,129	2,146	60,384	5,472	177,292	96.9	97.1
Miss------	281	21,888	100.0	100.0	25	2,015	5	492	291	22,867	94.5	96.5
Mo--------	501	26,212	100.0	100.0	81	4,725	181	5,859	682	32,071	100.0	100.0
Mont------	63	3,833	87.5	88.8	12	791	29	2,542	92	6,375	91.1	93.0
Nebr------	394	18,729	99.5	99.6	52	2,819	86	3,200	480	21,929	91.4	95.6
Nev-------	36	4,095	58.1	64.2	10	820	2	1,145	38	5,240	59.4	69.6
N. H------	256	13,014	100.0	100.0	55	2,766	62	2,559	324	15,900	100.0	100.0
N. J------	393	23,992	100.0	100.0	58	3,767	38	3,771	431	27,763	100.0	100.0
N. Mex----	31	6,916	100.0	100.0	11	2,622	1	109	32	7,025	91.4	80.8
N. Y------	3,758	186,511	100.0	100.0	362	18,000	2,400	88,590	6,158	275,101	97.5	97.8
N. C------	769	49,901	100.0	100.0	72	6,156	38	1,529	864	54,373	100.0	100.0
N. Dak----	143	5,472	99.3	92.7	14	652	20	504	180	6,556	90.5	89.8
Ohio------	2,117	90,978	100.0	100.0	395	17,696	463	14,473	2,580	105,451	73.9	79.6
Okla------	271	17,010	100.0	100.0	51	2,981	57	2,996	328	20,006	99.4	99.7
Oreg------	283	21,205	87.1	87.6	37	2,535	92	4,100	375	25,305	86.8	88.4
Pa--------	4,247	178,203	100.0	100.0	278	14,383	1,321	39,855	5,568	218,058	100.0	100.0
P. R------	6	820	100.0	100.0	--	-----	--	---	24	4,354	100.0	100.0
R. I------	46	2,230	100.0	100.0	20	807	--	---	46	2,230	100.0	100.0
S. C------	259	26,391	100.0	100.0	45	5,000	2	112	262	26,513	97.4	99.1
S. Dak----	141	5,604	100.0	100.0	27	1,152	253	7,886	394	13,490	74.9	85.9
Tenn------	503	31,011	100.0	100.0	58	3,884	6	231	517	31,589	95.0	97.0
Tex-------	341	32,296	99.1	99.4	73	7,135	26	1,563	373	34,455	98.7	98.9
Utah------	408	21,107	100.0	100.0	25	1,428	27	1,040	435	22,147	100.0	100.0
Vt--------	734	39,121	100.0	100.0	104	5,674	213	8,399	948	47,570	70.4	72.2
Va--------	972	62,956	100.0	100.0	101	7,520	58	2,385	1,042	65,837	100.0	100.0
Wash------	569	37,248	100.0	100.0	91	6,086	39	1,208	608	38,456	100.0	100.0
W. Va-----	157	8,367	100.0	100.0	17	1,158	30	1,053	187	9,420	77.0	87.6
Wis-------	3,010	131,243	100.0	100.0	500	22,540	9,708	312,826	12,718	444,069	87.6	88.3
Wyo-------	40	1,572	100.0	100.0	4	159	18	714	58	2,286	100.0	100.0
Total or percent	35,101	1,820,576	95.2	85.4	4,247	247,740	20,868	688,829	56,498	2,543,218	89.9	84.0

1/ Includes WADAM testing: Alabama, 8 herds, 507 cows; Connecticut, 6 herds, 449 cows; Georgia, 33 herds, 4,796 cows; Illinois, 115 herds, 4,121 cows; Kentucky, 39 herds, 1,508 cows; Louisiana, 197 herds, 13,062 cows; Mississippi, 5 herds, 487 cows; New Hampshire, 6 herds, 327 cows; North Carolina, 57 herds, 2,943 cows; North Dakota, 17 herds, 580 cows; Puerto Rico, 18 herds, 3,534 cows; South Carolina, 1 herd, 10 cows; Tennessee, 8 herds, 347 cows; Texas, 6 herds, 596 cows; Vermont, 1 herd, 50 cows; Virginia, 12 herds, 496 cows. Total = 529 herds, 33,813 cows.

2/ Percent of Standard DHIA and DHIR herds or cows enrolled in machine processing.

TABLE 6.--Status of Dairy Herd Improvement Association work in the United States (1906-1968, inclusive)

Year	Associations 1/	Supervisors 1/	Herds	Cows	Standard Plan		Average production			
					Cows per herd	Herds reported	Cows reported	Milk	Milk fat	Milk fat
	Number	Number	Number	Number	Number	Number	Number	Pounds	Percent	Pounds
1906---	1	-----	31	239	7.7	------	------	5,300	4.06	215
1907---	4	-----	------	1,606	----	------	------	5,366	4.10	220
1908---	6	-----	------	3,921	----	------	------	-----	----	---
1909---	25	-----	------	11,921	----	------	------	-----	----	---
1910---	40	-----	------	2/25,000	----	------	------	2/5,730	3.96	2/227
1911---	64	-----	------	2/40,000	----	------	------	-----	----	---
1912---	82	-----	------	2/43,000	----	------	------	-----	----	---
1913---	100	-----	------	47,150	----	------	------	-----	----	---
1914---	163	-----	------	73,280	----	------	------	-----	----	---
1915---	211	-----	------	105,526	----	------	------	-----	----	---
1916---	346	-----	------	150,677	----	------	------	-----	----	---
1917---	459	-----	11,720	216,831	18.5	------	------	-----	----	---
1918---	353	-----	9,778	172,518	17.6	------	------	-----	----	---
1919---	385	-----	10,000	167,313	16.7	------	------	-----	----	---
1920---	468	-----	11,948	203,472	17.0	------	------	-----	----	---
1921---	452	-----	11,209	193,928	17.3	------	------	6,175	4.00	247
1922---	513	-----	12,508	215,321	17.2	------	------	-----	----	---
1923---	627	-----	16,357	277,010	16.9	------	------	-----	----	---
1924 3/	---	-----	------	-------	----	------	------	-----	----	---
1925---	732	-----	18,677	307,073	16.4	------	42,302	7,189	3.95	284
1926---	777	-----	19,540	327,653	16.8	------	103,443	7,331	3.96	290
1927---	837	-----	21,128	362,014	17.1	------	116,509	7,411	3.95	293
1928---	947	-----	23,327	414,891	17.8	------	152,412	7,476	3.96	296
1929---	1,090	-----	26,182	465,804	17.8	------	194,859	7,498	3.97	298
1930---	1,143	-----	27,888	507,549	18.2	------	235,624	7,642	3.96	303
1931---	1,112	-----	26,308	510,714	19.4	------	219,924	7,812	3.92	306
1932---	1,005	-----	20,351	427,044	21.0	------	186,683	7,858	3.95	310
1933---	881	-----	15,447	358,501	23.2	------	163,014	7,849	3.99	313
1934---	793	-----	13,694	325,837	23.8	------	203,930	8,015	4.02	322
1935---	809	-----	15,573	364,218	23.4	------	200,367	7,977	4.04	322
1936---	876	-----	17,344	404,412	23.3	------	257,248	7,912	4.03	319
1937---	992	-----	20,772	496,562	23.9	------	354,568	7,923	4.04	320
1938---	1,106	-----	23,701	558,993	23.6	------	448,025	7,831	4.05	317
1939---	1,228	-----	25,949	625,284	24.1	------	507,563	7,977	4.05	323
1940---	1,300	-----	27,948	676,141	24.2	------	545,382	8,133	4.07	331
1941---	1,383	-----	31,381	763,502	24.3	------	591,103	8,225	4.07	335
1942---	1,421	-----	32,957	816,11[illegible]	24.8	------	514,758	8,323	4.07	339
1943---	1,057	-----	24,155	616,972	25.5	------	375,914	8,325	4.06	338
1944---	954	-----	20,825	561,587	27.0	------	383,337	8,296	4.05	336
1945---	949	-----	21,254	577,200	27.2	------	384,360	8,592	4.03	346
1946---	1,124	-----	23,331	627,878	27.0	------	413,554	8,635	4.04	349
1947---	1,426	-----	28,812	775,546	26.9	------	533,061	8,638	4.03	348
1948---	1,668	-----	33,274	886,129	26.6	------	620,385	8,675	4.03	350
1949---	1,787	-----	35,851	943,939	26.3	------	729,150	8,907	4.03	359
1950---	1,973	-----	40,100	1,088,872	27.2	------	836,922	9,172	4.03	370
1951---	2,143	-----	42,949	1,186,615	27.6	------	885,859	9,195	4.02	370
1952---	2,109	-----	40,105	1,166,297	29.1	------	928,376	9,192	3.98	366
1953---	2,151	-----	40,983	1,226,588	29.9	------	1,020,326	9,253	3.98	368
1954---	2,175	-----	41,254	1,311,698	31.8	------	1,079,557	9,363	3.97	372
1955---	2,288	-----	41,240	1,333,866	32.3	------	1,175,378	9,502	3.95	375
1956---	2,266	-----	40,984	1,406,306	34.4	------	1,229,971	9,713	3.94	383
1957 4/	1,700	2,310	41,638	1,479,799	35.5	------	1,256,129	9,894	3.93	389
1958---	1,544	2,293	39,985	1,548,884	38.7	------	1,345,750	10,068	3.91	394
1959---	1,500	2,337	40,284	1,607,538	39.9	------	1,406,665	10,327	3.88	401
1960---	1,509	2,397	41,293	1,746,752	42.3	------	5/1,343,725	5/10,561	3.87	5/409
1961---	1,395	2,448	42,558	1,867,469	43.9	28,649	1,280,785	10,796	3.87	418
1962---	1,436	2,472	42,034	1,958,355	46.6	32,794	1,531,826	11,032	3.86	426
1963---	1,441	2,516	41,937	2,006,534	47.8	35,378	1,674,803	11,286	3.85	434
1964---	1,420	2,474	40,670	2,010,144	49.4	35,689	1,746,475	11,685	3.83	447
1965---	1,424	2,439	40,075	2,087,581	52.1	35,604	1,821,252	11,976	3.82	457
1966---	1,418	2,378	38,879	2,058,592	52.9	34,886	1,852,533	12,127	3.81	462
1967---	1,344	2,319	37,683	2,098,919	55.7	34,515	1,890,024	12,307	3.80	468
1968---	1,318	2,304	36,869	2,131,929	57.8	------	---------	------	----	---

1/ Number of associations and supervisors include all plans.
2/ Estimated.
3/ Date for collecting data changed in 1924 from July 1 to January 1.
4/ Prior to 1957 associations were counted on the basis of supervisor circuits.
5/ National testing year changed in 1960 to begin May 1. These values are averages of 1959 and 1961.

TABLE 7.--Twelve-year production summary: U.S. cows and DHIA cows (1956-1967)

Year 1/	U. S. report for all milk cows					Standard DHIA Plan			
	Milk cows	Milk produced	Production/cow			Cows	Production/cow		
			Milk	Milk fat	Milk fat		Milk	Milk fat	Milk fat
	Thousands	Mil. lb.	Pounds	Percent	Pounds	Number	Pounds	Percent	Pounds
1956--------	20,501	124,860	6,090	3.83	233	1,479,799	9,713	3.94	383
1957--------	19,774	124,628	6,303	3.81	240	1,548,884	9,894	3.93	389
1958--------	18,711	123,220	6,585	3.78	249	1,607,538	10,068	3.91	394
1959--------	17,901	121,989	6,815	3.76	256	1,746,752	10,327	3.88	401
1960--------	17,515	123,109	7,029	3.76	264	1,867,469	2/10,561	3.87	2/409
1961--------	17,243	125,707	7,290	3.74	273	1,958,355	10,796	3.87	418
1962--------	16,842	126,251	7,496	3.74	280	2,006,534	11,032	3.86	426
1963--------	16,260	125,202	7,700	3.71	286	2,010,144	11,286	3.85	434
1964--------	15,677	126,967	8,099	3.70	300	2,087,581	11,685	3.83	447
1965--------	14,954	124,173	8,304	3.70	307	2,058,592	11,976	3.82	457
1966--------	14,093	119,892	8,507	3.69	314	2,098,919	12,127	3.81	462
1967--------	3/13,524	3/119,294	3/8,821	3.68	3/325	2,131,929	12,307	3.80	468

1/ Based on succeeding January 1 reports of cows on test in the National Cooperative Dairy Herd Improvement Program.

2/ National testing year changed in 1960 to begin May 1. These values are averages of 1959 and 1961.

3/ Statistical Reporting Service (USDA), "Milk Production and Dairy Products,Annual Statistical Summary 1967", February 1968. Data are preliminary.

TABLE 8.--Twelve-year summary of the National Cooperative Dairy Herd Improvement Program: U.S. cows and DHIA cows (1956-1967)

Year 1/	Standard Plan		Owner-Sampler Plan		Weigh-a-Day-a-Month Plan		Milk cows in U.S.	
	Cows on test	Proportion of U.S. cows	Cows on test	Proportion of U.S. cows	Cows on test	Proportion of U.S. cows	Cows 2/	Proportion of U.S. cows
	Number	Percent	Number	Percent	Number	Percent	Thousands	Percent
1956--------	1,479,799	7.22	405,090	1.98	21,297	0.10	20,501	9.3
1957--------	1,548,884	7.83	490,001	2.48	79,489	.40	19,774	10.7
1958--------	1,607,538	8.59	549,916	2.94	74,814	.40	18,711	11.9
1959--------	1,746,752	9.76	615,899	3.44	76,392	.43	17,901	13.6
1960--------	1,867,469	10.66	655,885	3.74	70,847	.40	17,515	14.8
1961--------	1,958,355	11.36	698,302	4.05	70,617	.41	17,243	15.8
1962--------	2,006,534	11.91	726,478	4.31	50,492	.30	16,842	16.5
1963--------	2,010,144	12.36	752,229	4.63	60,149	.37	16,260	17.4
1964--------	2,087,581	13.32	818,406	5.22	56,570	.36	15,677	18.9
1965--------	2,058,592	13.77	839,838	5.62	56,957	.38	14,954	19.8
1966--------	2,098,919	14.89	825,127	5.85	53,429	.38	14,093	21.1
1967--------	2,131,929	15.76	847,485	6.27	48,853	.36	13,524	22.4

1/ Based on succeeding January 1 reports of cows on test in the National Cooperative Dairy Herd Improvement Program.

2/ Average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA). See footnote 1, table 7.

TABLE 9.--Counties, by State, with 40 percent or more cows included in the National Cooperative Dairy Herd Improvement Program--January 1, 1968
(Numerals in parenthesis at the end of county listing show the percentage of the State's counties that have 25 percent or more of their cows on test.)

State and county	Cows enrolled in DHIA plans
	Percent
ALABAMA	
Russell	77
Etowah	55
Elmore	49
Cherokee	42
Talladega	40
(12%)	
ARIZONA	
Cochise	100
Pima	100
Pinal	100
Graham	80
Maricopa	40
(36%)	
CALIFORNIA	
Contra Costa	89
Monterey	89
Ventura	87
Marin	81
Tehama	79
Madera	76
Kern	70
Santa Barbara	69
San Joaquin	67
Stanislaus	59
Fresno	58
Santa Clara	57
Merced	56
Sonoma	56
Placer	54
Sacramento	54
San Diego	54
San Luis Obispo	54
Napa	51
Sutter	51
Tulare	51
San Benito	48
Shasta	48
Riverside	47
Colusa	46
San Bernardino	45
Solano	45
Alameda	43
Kings	42
(66%)	
COLORADO	
Chaffee	43
(8%)	
CONNECTICUT	
Tolland	58
Hartford	50
Litchfield	47
New Haven	40
New London	40
Windham	40
(100%)	
DELAWARE	
(33%)	
FLORIDA	
Madison	76
Orange	72
Manatee	61
FLORIDA (contd.)	
Putnam	59
Gilchrist	57
Washington	57
Jackson	51
Jefferson	51
Glades	50
Leon	50
Seminole	49
Alachua	46
Union	46
(30%)	
GEORGIA	
Douglas	95
Echols	95
Houston	82
Macon	77
Mitchell	76
Dooly	75
Jeff Davis	75
Peach	75
Clarke	67
Newton	66
Burke	65
Clayton	65
Jefferson	60
Fayette	55
Walton	51
Coffee	50
Jones	48
McDuffie	48
Schley	48
Stewart	48
Butts	45
DeKalb	45
Dougherty	45
Rockdale	45
Tattnall	45
Thomas	44
Carroll	43
Brooks	40
Lamar	40
Lee	40
(26%)	
HAWAII	
Maui	43
(60%)	
ILLINOIS	
Lawrence	44
Monroe	43
Clark	42
Champaign	40
(18%)	
INDIANA	
(13%)	
IOWA	
Dallas	42
Story	42
(15%)	
KANSAS	
Finney	64
Saline	56
Comanche	53

TABLE 9.--Counties, by State, with 40 percent or more cows included in the National Cooperative Dairy Herd Improvement Program--January 1, 1968--Continued

State and county	Cows enrolled in DHIA plans
	Percent
KANSAS (contd.)	
Pawnee	40
(20%)	
LOUISIANA	
Richland	61
Acadia	58
Morehouse	58
West Carroll	48
(20%)	
MAINE	
Oxford	53
Androscoggin	47
Cumberland	41
(44%)	
MARYLAND	
(33%)	
MASSACHUSETTS	
Hampshire	44
Berkshire	42
(50%)	
MICHIGAN	
Ingham	46
Jackson	46
Lenawee	43
Barry	42
Calhoun	42
Kalamazoo	42
(35%)	
MINNESOTA	
(10%)	
MISSOURI	
(1%)	
MONTANA	
(2%)	
NEBRASKA	
(6%)	
NEVADA	
Clark	100
Churchill	48
Lincoln	40
(24%)	
NEW HAMPSHIRE	
Sullivan	57
Merrimack	46
Grafton	40
Hillsborough	40
(90%)	
NEW JERSEY	
Middlesex	63
Burlington	43
(38%)	
NEW MEXICO	
Dona Ana	72
Sierra	63
(13%)	
NEW YORK	
Dutchess	49
Columbia	48
Long Island	44
NEW YORK (contd.)	
Tompkins	44
Ontario	43
(44%)	
NORTH CAROLINA	
Carteret	100
Perquimans	92
Lenoir	91
New Hanover	81
Brunswick	72
Wake	68
Orange	65
Beaufort	63
Durham	59
Hyde	58
Craven	57
Onslow	54
Pitt	54
Jones	51
Columbus	50
Bladen	48
Pender	46
Cumberland	45
Washington	45
Guilford	43
Chatham	42
(49%)	
OHIO	
Clark	58
Marion	52
Fulton	43
Erie	42
Hamilton	42
Pickaway	42
Wayne	42
(44%)	
OKLAHOMA	
(10%)	
OREGON	
Lane	44
Josephine	41
(22%)	
PENNSYLVANIA	
Montgomery	55
Blair	48
Huntingdon	44
Lancaster	41
Union	40
(61%)	
RHODE ISLAND	
(40%)	
SOUTH CAROLINA	
Kershaw	80
Allendale	73
Sumter	73
Bamberg	68
Jasper	63
Orangeburg	59
Hampton	56
Newberry	56
Colleton	50
Saluda	50
Beaufort	47
Calhoun	45
Lee	44
Laurens	43
SOUTH CAROLINA (contd.)	
Barnwell	42
Darlington	42
Marlboro	40
(46%)	
TENNESSEE	
Dyer	98
Gibson	41
(4%)	
TEXAS	
Deaf Smith	75
Goliad	75
Hutchinson	75
San Patricio	75
Starr	75
Milam	65
Willacy	63
Burleson	62
Scurry	45
(7%)	
UTAH	
Wasatch	57
Salt Lake	55
Summit	46
Washington	43
(45%)	
VERMONT	
Washington	47
Windsor	46
Bennington	45
Addison	41
(86%)	
VIRGINIA	
James City	98
City of Newport News	73
Northampton	70
Lancaster	62
City of Chesapeake	57
City of Virginia Beach	56
Henrico	56
Isle of Wight	55
Culpeper	53
Orange	50
Prince George	50
Roanoke	50
Nansemond	48
Hanover	47
Madison	46
Pulaski	45
Charlotte	42
Clarke	42
Loudoun	42
Rockingham	42
Amelia	41
Powhatan	41
Nottoway	40
Prince William	40
Southampton	40
(43%)	
WASHINGTON	
Asotin	41
Klickitat	41
(36%)	
WEST VIRGINIA	
(4%)	
WISCONSIN	
Kenosha	51
Winnebago	44
(36%)	

TABLE 10 .--Lactation records received in 1967 [1]

State	DHIA cows on test 1-1-67	1967 production records				1966 production records	
		Punched (1095 cards)	Magnetic tape	Total	Proportion of cows enrolled in DHIA	Total	Proportion of cows enrolled in DHIA
	Number	Number	Number	Number	Percent [2]	Number	Percent [2]
Ala--------	30,821	6,626	23,490	30,116	97.7	25,955	89.8
Alaska-----	165	------	208	208	126.1	188	95.9
Ariz-------	16,544	5,645	------	5,645	34.1	4,745	29.7
Ark--------	3,800	6	4,461	4,467	117.6	3,555	103.4
Calif------	362,452	75,359	------	75,359	20.8	74,120	21.4
Colo-------	14,253	8,008	------	8,008	56.2	8,011	51.6
Conn-------	22,678	------	23,460	23,460	103.4	27,340	120.6
Del--------	4,461	------	4,407	4,407	98.8	6,058	127.7
Fla--------	20,089	5,189	15,474	20,663	102.9	17,246	90.7
Ga---------	31,116	6,830	28,527	35,357	113.6	27,003	91.4
Hawaii-----	4,480	------	3,215	3,215	71.8	873	38.0
Idaho------	30,715	1,431	25,839	27,270	88.8	20,641	82.6
Ill--------	61,352	60,275	------	60,275	98.2	57,865	94.7
Ind--------	43,142	5	47,193	47,198	109.4	45,232	97.8
Iowa-------	59,470	81	69,282	69,363	116.6	62,715	105.2
Kans-------	35,328	58	42,150	42,208	119.5	36,141	107.1
Ky---------	22,048	5,508	17,528	23,036	104.5	20,120	91.5
La---------	7,484	1,297	5,531	6,828	91.2	4,718	79.6
Maine------	17,853	------	18,866	18,866	105.7	22,970	126.9
Md---------	40,122	42,913	------	42,913	107.0	41,405	92.2
Mass-------	21,164	------	21,441	21,441	101.3	26,671	128.4
Mich-------	81,341	80,196	------	80,196	98.6	79,607	93.4
Minn-------	122,241	130,027	------	130,027	106.4	119,501	96.3
Miss-------	18,698	4,267	14,356	18,623	99.6	15,068	87.4
Mo---------	24,011	43	26,795	26,838	111.8	21,835	112.1
Mont-------	3,378	2,487	------	2,487	73.6	2,182	62.6
Nebr-------	16,696	24	18,505	18,529	111.0	15,515	100.2
Nev--------	6,446	1,744	------	1,744	27.1	2,402	58.2
N. H-------	12,332	------	13,006	13,006	105.5	16,172	128.2
N. J-------	25,235	------	25,315	25,315	100.3	33,536	132.7
N. Mex-----	6,244	5,810	------	5,810	93.0	3,455	91.1
N. Y-------	181,758	------	186,679	186,679	102.7	240,593	133.8
N. C-------	47,669	11,421	38,875	50,296	105.5	43,628	93.8
N. Dak-----	6,100	14	6,060	6,074	99.6	5,938	107.4
Ohio-------	90,856	5	96,770	96,775	106.5	95,348	101.3
Okla-------	14,163	19	16,344	16,363	115.5	12,615	98.0
Oreg-------	26,300	------	24,048	24,048	91.4	17,720	68.4
Pa---------	179,732	------	167,820	167,820	93.4	169,514	96.6
P. R-------	893	------	------	------	----	------	----
R. I-------	2,192	------	2,115	2,115	96.5	2,963	121.2
S. C-------	24,880	5,354	19,283	24,637	99.0	21,235	94.9
S. Dak-----	6,650	8	6,983	6,991	105.1	6,806	100.9
Tenn-------	30,429	7,071	24,424	31,495	103.5	26,136	91.2
Tex--------	29,050	7,462	22,367	29,829	102.7	24,810	88.2
Utah-------	20,318	18,704	------	18,704	92.1	20,059	95.6
Vt---------	39,064	61	38,690	38,751	99.2	48,559	103.3
Va---------	59,065	14,411	49,124	63,535	107.6	60,544	105.0
Wash-------	37,060	------	43,275	43,275	116.8	30,130	114.4
W. Va------	8,791	------	8,500	8,500	96.7	8,764	132.5
Wis [3]-----	126,362	------	142,274	142,274	112.6	110,457	85.7
Wyo--------	1,428	235	------	235	16.5	310	27.3
U.S--------	2,098,919	508,594	1,342,680	1,851,274	88.2	1,788,974	86.9

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[1] Lactation record input for May and September 1967, and January 1968 production runs.

[2] Percentages vary by State and may exceed 100 percent depending upon reporting and processing procedures in December and January of each year and year to year changes in reporting procedures.

[3] Does not include approximately 200,000 records for previous years that were resubmitted.

TABLE 11.--Ten-year summary: Lactation records received by USDA

Year	Standard DHIA cows enrolled on January 1 of each year	Lactation records reported to USDA	Standard DHIA cows represented by records reported
	Number	Number	Percent
1958	1,548,884	786,496	51
1959	1,607,538	927,998	58
1960	1,746,752	886,495	51
1961	1,867,469	1,084,799	58
1962	1,958,355	1,211,407	62
1963	2,006,534	1,320,423	66
1964	2,010,144	1,437,959	72
1965	2,087,581	1,749,752	84
1966	2,058,592	1,788,974	87
1967	2,098,919	1,851,274	88

TABLE 12.--Relative frequency of error conditions in lactation records rejected in preliminary edits [1/]

Error conditions	Total error conditions	Percent of all error conditions
Registered cows		
Zero dam number	2,733	19.39
Zero sire number	2,498	17.73
Cow and dam breed unequal	1,044	7.41
Eartag sire number	803	5.70
Cow and sire breed unequal	798	5.66
Alpha sire number	484	3.43
Zero cow number	394	2.80
Blank cow breed	393	2.79
Alpha dam number	359	2.55
Alpha cow number	340	2.41
"Eight" cow breed	206	1.46
Zero cow breed	41	.29
Grade cows		
"Non eight" eartag cow breed, unequal sire breed	356	2.53
Eartag cow breed "eight", "non eight" sire and dam equal	55	.39
Registered or grade cows		
Blanks in any position of record	1,844	13.08
Zero sire breed	753	5.34
Alpha in hi-order 2 positions of cow number	389	2.76
Zero dam breed	252	1.79
Zero days in milk	222	1.58
Alpha in hi-order 2 positions of dam number	73	.52
Alpha in hi-order 2 positions of sire number	48	.34
Blank days in milk	6	.04
Alpha "J" through "Z" in "Termination" code	2	.01
Total	14,093	100.00

[1/] Total lactation records in error = 10,259. Proportion of error conditions in the 1,871,591 lactation records processed is 0.75 percent.

TABLE 13.--Relative frequency of Standard DHIA lactation record rejects in 1967, by reason for rejection

Reject code	Type of error	Total error conditions	Percent of all rejects	Percent of all records entered 1/
B	Conflicting or questionable birth date	28,120	22.4	1.5
A	Conflict with previous information supplied	24,147	19.3	1.3
I	Invalid characters - usually blanks or alphabetics	20,073	16.0	1.1
F	Conflicting or questionable calving date	13,471	10.7	0.7
S	Conflicting or questionable sire number	12,848	10.2	.7
D	Conflicting or questionable dam number	7,197	5.7	.4
C	Conflicting or questionable cow number	3,699	2.9	.2
J	Equal identification number for two or more of the animals in the pedigree	707	0.6	(2/)
E	Conflicting or questionable breed code	552	.4	(2/)
G	Invalid State code	162	.1	(2/)
M	Conflicting or questionable milk, pounds	147	.1	(2/)
O	Conflicting or questionable fat, pounds	94	.1	(2/)
P	Conflicting or questionable percent fat	85	.1	(2/)
N	Conflicting or questionable days in milk	5	(2/)	(2/)
L	Days milked 3X exceed days in milk	2	(2/)	(2/)
Pre-edit rejects 3/		14,093	11.2	.8
Total		4/125,402	100.0	6.7

1/ The 1,851,274 incoming records plus 20,317 records re-entered after correction = 1,871,591.

2/ Less than 0.05 percent.

3/ For breakdown of pre-edit rejects, see table 12.

4/ A total of 118,044 records were rejected, but the higher number of error conditions indicate some records contained more than one wrong, questionable, or conflicting data item.

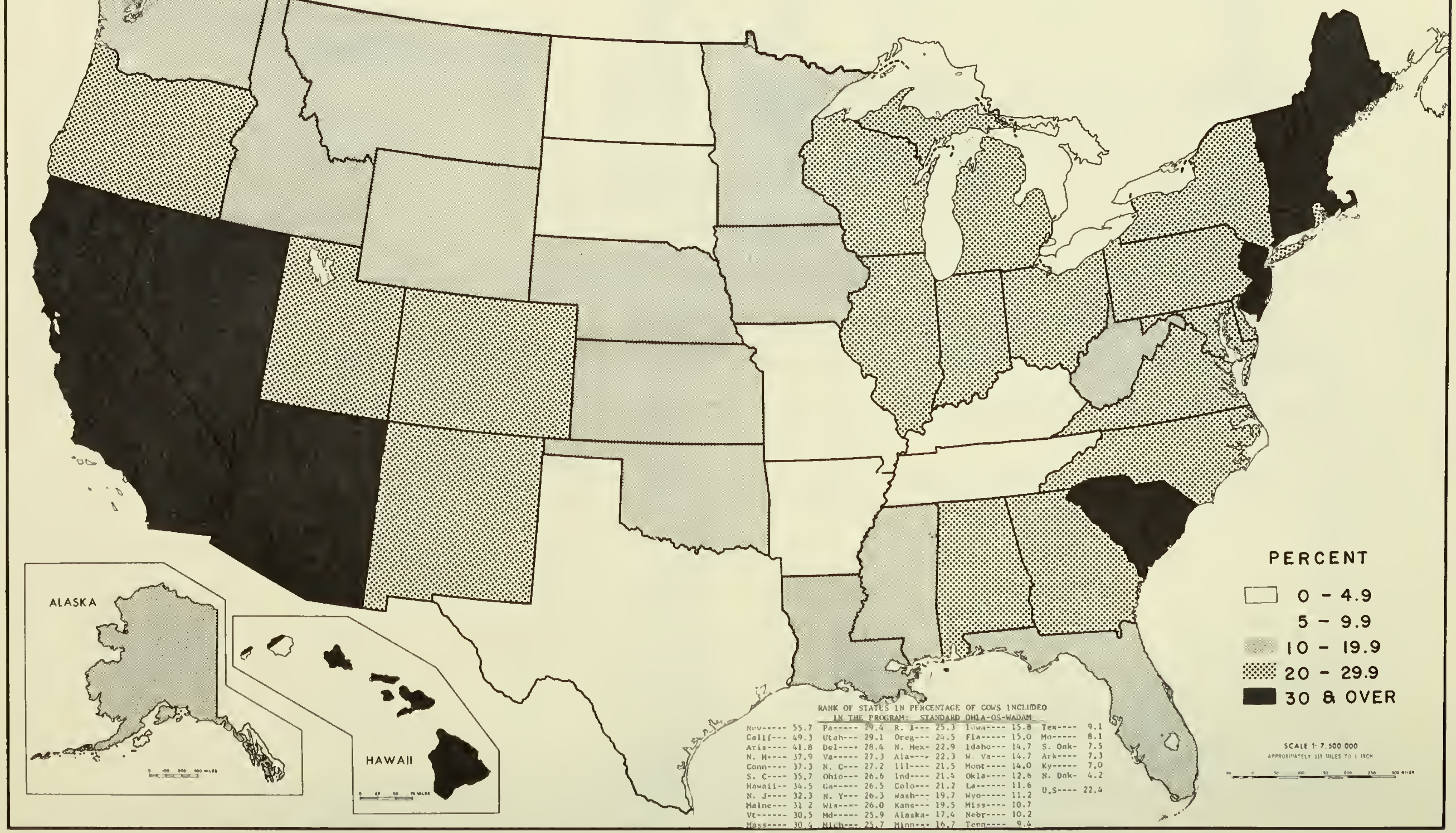
TABLE 14.-Bulls summarized in 1967

Breed	April	May	September	Total
	Number	Number	Number	Number
Ayrshire---------	1,292	39	142	1,473
Guernsey---------	6,798	250	1,362	8,410
Holstein---------	17,448	825	2,394	20,667
Jersey-----------	4,722	227	779	5,728
Brown Swiss------	1,055	74	240	1,369
M. Shorthorn-----	335	24	66	425
Red Dane---------	18	4	7	29
Red Poll---------	2	---	-----	2
Total sires summarized-	31,670	1,443	4,990	38,103

TABLE 15.-Screening levels and cows qualifying for the DHIA Cow Performance Index List by breed

Breed	Minimum qualification standards			Number of cows qualifying
	A	B		
	Milk index	Milk index	Fat index	
	Pound	Pound	Pound	Number
Ayrshire--------	1,089	814	39	253
Guernsey--------	724	544	19	588
Holstein--------	734	579	14	5,548
Jersey----------	559	359	19	559
Brown Swiss-----	717	506	19	169
M. Shorthorn----	349	199	9	94

NATIONAL COOPERATIVE DAIRY HERD IMPROVEMENT PROGRAM
PERCENTAGE OF COWS IN PROGRAM JANUARY 1, 1968



RANK OF STATES IN PERCENTAGE OF COWS INCLUDED IN THE PROGRAM: STANDARD DHIA-OS-WADAM

Nev-----	55.7	Pa------	29.4	R. I---	25.3	Iowa----	15.8	Tex----	9.1
Calif---	49.3	Utah---	29.1	Oreg---	24.5	Fla-----	15.0	Mo-----	8.1
Ariz----	41.8	Del----	28.4	N. Mex-	22.9	Idaho---	14.7	S. Dak-	7.5
N. H----	37.9	Va-----	27.3	Ala----	22.3	W. Va---	14.7	Ark----	7.3
Conn----	37.3	N. C---	27.2	Ill----	21.5	Mont----	14.0	Ky-----	7.0
S. C----	35.7	Ohio---	26.6	Ind----	21.4	Okla----	12.6	N. Dak-	4.2
Hawaii--	34.5	Ga-----	26.5	Colo---	21.2	La------	11.6	U.S----	22.4
N. J----	32.3	N. Y---	26.3	Wash---	19.7	Wyo-----	11.2		
Maine---	31.2	Wis----	26.0	Kans---	19.5	Miss----	10.7		
Vt------	30.5	Md-----	25.9	Alaska-	17.4	Nebr----	10.2		
Mass----	30.4	Mich---	25.7	Minn---	16.7	Tenn----	9.4		

OFFICIALS IN CHARGE OF DAIRY-HERD-IMPROVEMENT ASSOCIATIONS IN THE STATES

Ala-----R. S. Jones, Jr., Dairy Science Dept., Auburn University, Auburn 36830.
Alaska--W. J. Sweetman, Experiment Station Research Staff, University of Alaska, Palmer 99645.
Ariz----W. R. Van Sant, Dept. of Dairy Science, University of Arizona, Tucson 85721.
Ark-----L. Ratcliff, Animal Industry & Veterinary Science Dept., University of Arkansas, Little Rock 72203.
Calif---C. L. Pelissier, Extension Service, University of California, Davis 95616.
Colo----D. C. Jordan, Animal Science Dept., Colorado State University, Fort Collins 80521.
Conn----R. H. Benson, Animal Industries Dept., University of Connecticut, Storrs 06268.
Del-----W. R. Hesseltine, Animal and Poultry Science Dept., University of Delaware, Newark 19711.
Fla-----C. W. Reaves, Extension Dairy Section, University of Florida, Gainesville 32603.
Ga------W. H. McKinney, Animal Industry Division, University of Georgia, Athens 30601.
Hawaii--J. H. Koshi, Animal Science Dept., University of Hawaii, Honolulu 96822.
Idaho---G. W. Cleveland, Dairy Science Dept., University of Idaho, Boise 83701.
Ill-----J. G. Cash, Dairy Science Dept., University of Illinois, Urbana 61803.
Ind-----S. M. Gregory, Dept. of Animal Sciences, Purdue University, Lafayette 47907.
Iowa----D. E. Voelker, Animal & Dairy Science Dept., Iowa State University, Ames 50010.
Kans----E. R. Bonewitz, Dairy Science Dept., Kansas State University, Manhattan 66504.
Ky------E. C. Troutman, Dairy Science Dept., University of Kentucky, Lexington 40506.
La------N. J. Matherne, La. Agr. Extension Service, Louisiana State University, Baton Rouge 70803.
Maine---N. R. Ness, Animal Science Dept., University of Maine, Orono 04473.
Md------C. M. Chance, Dairy Science Dept., University of Maryland, College Park 20742.
Mass----S. J. Lyford, Jr., Veterinary & Animal Sciences Dept., University of Massachusetts, Amherst 01003.
Mich----M. A. Wilson, Dairy Dept., Michigan State University, East Lansing 48823.
Minn----R. W. Wayne, Dairy Husbandry Dept., University of Minnesota, St. Paul 55101.
Miss----G. B. Crain, Dairy Science Dept., Mississippi State University, State College 39762.
Mo------A. G. Lane, Dairy Husbandry Dept., University of Missouri, Columbia 65202.
Mont----E. J. Peace, Dept. of Animal Science & Range Management, Montana State College, Bozeman 59715.
Nebr----C. W. Nibler, Dairy Science Dept., University of Nebraska, Lincoln 68503.
Nev-----H. P. Adams, Animal Science Dept., University of Nevada, Reno 89507.
N. H----C. H. Boynton, Animal Science Dept., University of New Hampshire, Durham 03824.
N. J----E. T. Oleskie, Animal Science Dept., Rutgers University, New Brunswick 08903.
N. Mex--J. B. Ells, Dairy Dept., New Mexico State University, University Park 88070.
N. Y----J. D. Burke, Animal Husbandry Dept., Cornell University, Ithaca 14850.
N. C----F. D. Sargent, Animal Science Dept., North Carolina State University, Raleigh 27607.
N. Dak--G. R. Fisher, Dairy Husbandry Dept., North Dakota State University, Fargo 58103.
Ohio----W. R. Taylor, Dairy Science Dept., Ohio State University, Columbus 43210.
Okla----J. E. Pendleton, Dept. of Dairying, Oklahoma State University, Stillwater 74075.
Oreg----D. E. Anderson, Animal Science Dept., Oregon State University, Corvallis 97331.
Pa------H. C. Gilmore, Dairy Science Dept., Pennsylvania State University, University Park 16802.
P. R----C. A. Calderon, Animal Husbandry Dept., University of Puerto Rico, Rio Piedras 00931.
R. I----J. W. Atwood, Dairy Science Dept., University of Rhode Island, Kingston 02881.
S. C----C. H. Lomas, Dairy Science Dept., Clemson University, Clemson 29631.
S. Dak--E. J. Kleen, Dairy Science Dept., South Dakota State University, Brookings 57007.
Tenn----V. D. Parsons, Dairy Dept., University of Tennessee, P.O. Box 1071, Knoxville 37901.
Tex-----J. W. Davis, Jr., Dairy Science Dept., Texas A & M University, College Station 77841.
Utah----J. J. Barnard, Dairy Industry Dept., Utah State University, Logan 84321.
Vt------W. P. Leamy, Animal & Dairy Science Dept., University of Vermont, Burlington 05401.
Va------W. N. Patterson, Dairy Science Dept., Virginia Polytechnic Institute, Blacksburg 24061.
Wash----B. F. Kelso, Animal Sciences Dept., Washington State University, Puyallup 98371.
W. Va---R. O. Kelley, Animal Industry & Veterinary Science Dept., West Virginia University, Morgantown 26506.
Wis-----E. E. Starkey, Dairy Science Dept., University of Wisconsin, Madison 53706.
Wyo-----I. W. Slater, Division of Animal Science, University of Wyoming, Laramie 82071.

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Dairy-Herd-Improvement Letter
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INTRODUCTION

Included in this Dairy Herd Improvement Letter are two articles that explain the methodology and interpretation of USDA-DHIA Sire Summaries. A third article examines the distribution of USDA Sire Summaries on bulls active in artificial insemination (AI) in 1967 and what these data mean to dairymen using AI.

NOTES AND CONCEPTS USED IN USDA SIRE SUMMARY PROCEDURES

by R. D. Plowman, Chief
Dairy Cattle Research Branch, USDA
Beltsville, Maryland

In 1962, USDA adopted a method of daughter-herdmate comparisons for summarizing the progeny performance of sires. This decision to change from daughter-dam comparisons was made because research results had suggested that sire summaries could be more accurate when expressed as differences from herdmates. The daughter-dam comparison was a good method provided that certain assumptions could be met. These assumptions were as follows:

1. Same environmental treatment for both daughters and dams.
2. Future mates of bull similar to dams of original daughters.

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3. Same environment for future daughters as for first daughters.

These assumptions are difficult to achieve. Too often, the large increase in performance of daughters over that of dams and attributed to the sire was really due to the better environment provided to the daughters by the owner or herdsman. Even if the assumptions were met, the best a daughter-dam comparison could tell us was how a particular bull did when mated to a particular group of cows.

We want a sire summary to tell us what to expect of future daughters based on those already in production. A study completed at Cornell University evaluated different methods of proving sires. This study related initial summaries to summaries made at a later date and considered several methods of evaluation. In other words, it determined the future performance of a bull based on his present daughters. Table 1 gives the results of this study. This table clearly shows that the USDA AI herdmate method of estimating future performance of a sire's daughters is more accurate than the other methods considered.

The herdmate comparison also provides for a method of making judgments among bulls. Each daughter of a sire is compared with other cows in the same herd that freshened at approximately the same time. Since these other cows or herdmates have sires, we are essentially comparing this bull with sires of the herdmates.

1. Steps in computing the USDA sire summary

   A. Standardization of records for age effects.

      In order to use records from all cows in a particular herd, it is necessary to standardize records for age. Recent research by USDA has shown that age correction factors vary greatly in magnitude by season of calving, geographical region, and milk and fat yield. These studies indicate that separate factors should be used to correct for these sources of error. Data analysis showed that the two seasons of November through June and July through October would be 88 percent as effective as using six 2-month seasons. Two-year-olds calving in the summer had factors about 0.03 to 0.06 lower than those of similar age cows calving in the winter season. Thus, if a single set of factors were used, cows calving in the winter season would be underestimated by approximately 300 pounds of milk and cows calving in the summer would be overestimated by the same amount. The evaluation of a bull on the basis of his initial daughters calving in only one season could be biased. Using these seasonal factors should largely eliminate such biases.

Factors developed for milk production were consistently higher by from 0.02 to 0.05 than those for fat production. Thus, separate factors are needed to accurately adjust for each trait.

Age correction factors for cows in the northeastern part of the United States tend to be higher than those for other regions. Increases with age are least in the Midwestern States and intermediate in the Southeast and West. The differences between regions are of about the same magnitude as the differences between seasons.

B. Weighting records for days in milk.

All records of all daughters should be included in sire summaries to prevent selection out of poorer producing daughters. Therefore, all records reported to USDA are used even if a cow has only one month on test. Short or incomplete records, however, are not given as much weight in the summary as completed records are given. Table 2 shows appropriate weights for projecting incomplete records.

C. Computing the "Predicted Difference."

The formula used to compute the Predicted Difference is as follows:

$$\frac{\Sigma w_i h^2}{4 + (\Sigma w_i - 1)\, h^2 + 4 \; \frac{\Sigma n_i (n_i - 1)}{N} \; c^2} \; [(\overline{D} - \overline{HM}) + 0.1\, (\overline{HM} - \text{Breed Av.})]$$

Adjustment for number of daughters and records per daughter	Adjustment for distribution of daus. over herds	Environmental correlation	Adjustment for herd environment and number of herdmates	Adjustment for herd genetic level

Where: w_i = Weight given to each cow according to the number of records she has completed

N = Total number of progeny of the bull

n_i = Number of progeny in the i^{th} herd

($N = n_i$ if all progeny are in one herd)

h^2 = Heritability of milk yield from paternal half-sib estimates in nationwide populations

c^2 = Residual correlations among half-sibs in the same herd after they are expressed as deviations from herdmates

$\overline{D}$ = Daughter average

$\overline{HM}$ = Adjusted herdmate average

The first part of this formula is the regression equation used to adjust the actual daughter-herdmate level for the effects of number of daughters, records per daughter, distribution of daughters over herds, and an environmental correlation. The number of herds involved and the distribution of daughters in these herds are important considerations that contribute to the accuracy and reliability of a sire summary. The information provided by several daughters in one herd is not as valuable as that provided by one daughter in each herd. Some of the reasons for making adjustments for the distribution of daughters across herds and the numbers of herds are as follows:

(1) In any one herd, a bull's progeny are not compared with a cross section or random sample of the progeny of bulls in the population, but only with the progeny of those bulls most recently used in the herd. These bulls may be limited in number and may be above or below the breed average in genetic merit.

(2) All progeny in a single herd, because of their environmental proximity to each other, appear to be more similar than their genetic relationship would indicate. Because they are generally of similar age and were raised and milked together, they are treated more alike than other and older cows in the herd. This is called an environmental correltion (C^2). In addition to strictly environmental similarities, C^2 also includes everything else in the correlation between half-sisters besides the additively genetic part.

(3) Age adjustment factors do not fit each herd exactly and thus daughters in one or a few herds could be either overestimated or underestimated when judged on a mature equivalent (ME) basis.

As the number of records on each cow increases, we are more confident of her true genetic merit.

Thus, a cow with more than one record should receive more weight in a sire summary than a cow with just one record. Table 3 gives the appropriate weights to cows depending on the number of records they have completed. These weights (w_i) are used in computing USDA sire summaries.

The second half of the formula for computing the Predicted Difference is needed to make adjustments for the number of herdmates and for the genetic level of the herd. Studies have shown that the average genetic difference between herd averages is only about 20 percent. (For example, herds that average 15,000 pounds of milk are only expected to be about 200 pounds genetically superior to herds that average 14,000 pounds of milk. The other 800 pounds of milk comes from better feeding and management.) This does not mean that any two specific herds are only 20 percent different, because this could vary to a considerable degree. The average difference, however, is only about 20 percent. In a sire summary we need to give a herd credit for being either above or below breed average. Since a sire contributes one-half of the genetic material, we give him credit for one-half of this genetic difference between herds. Therefore, 10 percent of the difference between the herdmate average and the breed average is added to the actual daughter-herdmate difference.

Some examples of the use of the formula for deriving the Predicted Difference are illustrated by the sire Jewelholm Supreme Cyclone 1341149. He has 15 daughters that average 18,508 pounds of milk. The herdmates average 16,357 pounds of milk. A C^2 of 0.14 and an h^2 of 0.19 are used in the example.

Example 1. Assume all daughters in a single herd with one record per daughter.

$$\frac{15(.19)}{4 + (14)\ .19 + \frac{4(15)(14)}{15}(.14)}\ [(18{,}508-16{,}357) + 0.1\ (16{,}357-13{,}059)]$$

$$= \frac{2.85}{6.66 + 7.84}\ [2{,}151 + 330]$$

$$= .197\ (2{,}481)$$

Predicted Difference = +489 Repeatability = 19.7%

Example 2. Assume 5 daughters in one herd, 3 in one herd, and 1 each in 7 herds. One record per daughter.

$$\frac{15(.19)}{4 + (14)\ .19 + \frac{4\ [5(4) + 3(2)]}{15}\ (.14)}\ [(18{,}508-16{,}357) + 0.1\ (16{,}357-13{,}059)]$$

$$= \frac{2.85}{6.66 + .971}\ [2{,}151 + 330]$$

$$= .373\ (2{,}481)$$

Predicted Difference = +928 Repeatability = 37.3%

Example 3. Assume 2 records per daughter, 5 daughters in one herd, and the rest in single herds.

$$\frac{15(1.33).19}{4 + [15(1.33)-1]\ .19 + \frac{4(5)(4)}{15}\ (.14)}\ [(18{,}508-16{,}357 + 0.1\ (16{,}357-13{,}059)]$$

$$= \frac{3.79}{7.60 + .745}\ [2{,}151 + 330]$$

$$= .454\ (2{,}481)$$

Predicted Difference = +1,126 Repeatability = 45.4%

The gross distinction between sire summaries based on daughters in many herds (AI Summary) and those based on only one or a few herds (Non-AI) is refined and sharpened. There is a growing trend among private dairymen to sample their bulls in many herds. We can cite examples of bulls with daughters in more than 50 herds that are still being called Non-AI. These sires need to be properly recognized depending on the scope of information available on them. Because of popular pedigrees, some AI bulls are initially sampled in a relatively few herds and with a limited number of daughters. These sires also need to be given their proper evaluation. Under these new procedures, distinctions between bulls will be based on the reliability with which their breeding value can be estimated. All records on daughters of a bull will be used regardless of whether they occur in a single herd or many herds. Proper weights will take into consideration the number of daughters, the number of herds, the number of records per daughter, and the distribution of daughters over herds.

2. Repeatability of the sire summary

You will note in the above example that a Repeatability value is attached to each Predicted Difference. This value indicates how sure we are that a bull's future performance in the general population will approximate his calculated breeding value.

The Repeatability value has nothing to do with conception rate or fertility level of a bull. Neither is it a measure of the transmitting ability of a bull for production traits. It is only a measure of the degree to which we expect the Predicted Difference to be repeated on subsequent provings. Repeatability tells us how sure we are of the breeding value estimated, and the Predicted Difference tells us how much genetic gain we can expect to make by using the bull. We stand to make much more genetic gain by using bulls with low Repeatabilities and high Predicted Differences than by using bulls with 99 percent Repeatabilities and low Predicted Differences.

Repeatability is the regression equation shown in the first half of the formula for computing the Predicted Difference. It is not really a new concept but merely the regression used to adjust the actual daughter-herdmate difference depending on the number and distribution of daughters and herds. It has always been in the formula but has not been pointed out as the Repeatability of the sire summary. Some people have expressed concern that bull proofs change from summary to summary. The accuracy of the estimates of Predicted Difference depends entirely on the scope of information going into the summary. For example, we may compute a Predicted Difference of plus 500 pounds on two sires, one based on 15 daughters and the other based on 500 daughters. The plus 500 pounds is our best estimate of the bulls' genetic ability; however, we are much more confident and have a much more precise estimate of the breeding value for the sire with many daughters. We can readily see in table 4 how the standard deviation of Predicted Differences changes at different Repeatabilities.

It is extremely important for both the user of a bull and his owner to recognize and understand the Repeatability concept. The user of a bull (whether in AI or private ownership) can take much of the gamble out of his breeding program by using those bulls with high Repeatability. Bulls must have daughters, however, before they can have Repeatabilities and, thus, an owner should fully understand those things that contribute to high Repeatabilities so that he can most effectively prove his bull. Table 5 illustrates the changes in Repeatability with different distributions of daughters and herds. Table 6 further illustrates these principles.

Percentage of incomplete first lactations

Listed for each sire is a figure representing the percentage of first lactation records that are reported to us as being incomplete. This figure is a reflection of the number of daughters of a bull that are culled during their first lactation. It also includes those daughters that are sold from the herd for reasons other than culling and those that may have died.

4. Effective daughters per herd

An index called "Effective Daughters" is included for each bull to show the effective distribution of daughters across herds. If his progeny are equally distributed across herds, the index will be the average number of daughters per herd. Deviations of the index from the average number of daughters will indicate that a large percentage of the progeny are in only one or a small proportion of the herds represented. The Predicted Difference and the Repeatability already reflect the effective distribution of the daughters across herds. Table 7 shows an example of the computation of the effective daughters and the formula for its calculation. You will see that the formula is part of the regression equation used to compute the Repeatability.

5. General services to the industry

We plan to compute sire summaries three times a year—in January, May, and September. Immediately after each run is completed, a computer printout on all active AI sires or those with semen available will be sent to the bull studs, breed associations, and the extension dairyman in charge of breeding in each State. A DHIA Form 1202 will be sent to the owner of other sires proven through the State extension dairy specialist or the respective breed association. This will include the calculated summary of the bull plus a listing of his individual daughters and their deviations from herdmates. We will also make this DHIA Form 1202 available for sires in AI that are summarized with less than 100 daughters.

Resummaries generally will be based on the principle that enough new daughters or records are available to increase the accuracy of the summary. Bulls known to be alive or active in AI and those requested by herd owners or other individuals will need lesser amounts of new information to qualify for resummary.

The major updating of historical information will take place at the May sire summary run of each year. The September and January runs will be based primarily on new bulls (no previous summary), bulls that are alive or active in AI, and the bulls on which there is a significant amount of new information. Please note that because of operational limitations, the decision on whether or not to resummarize a bull must be made before it is possible to compute the true Repeatability of the new summary. Thus, resummaries are based on approximations. Experience has shown that these approximations cause resummary of bulls for which there is a significant amount of new information, but avoid the very costly and wasteful resummary of bulls with little or no new data.

The detailed requirements for resummary of bulls are shown in tables 8 and 9.

Any system or method of sire summary is finally evaluated when dairymen apply it to their herds. Such evidence is available on the Beltsville herd and is presented in table 10. Over a period of approximately 12 years starting in 1948, proven sires were selected from those available in artificial breeding studs. These bulls were all initially proven in breeder herds and evaluated on the basis of a daughter-dam comparison. They were subsequently used heavily in AI and thus have a present Predicted Difference with a high Repeatability. Five sires, numbered 1-5 in table 10, even though initially selected because of a substantial increase of daughters over dams, turned out to have minus Predicted Differences. Their 101 daughters at Beltsville averaged 15,523 pounds of milk (2x,305,M.E.). Their average difference from Beltsville herdmates was -838 pounds of milk. Another group of five bulls all had plus Predicted Differences but ranging only from +56 to +485 pounds of milk. Their 90 daughters at Beltsville averaged 16,259 pounds of milk (2x,305,M.E.) and were +87 pounds of milk over herdmates.

The best five bulls (11-15 in table 10) all had Predicted Differences over 500 pounds of milk and their daughters averaged 16,913 pounds of milk (2x,305,M.E.) and were 622 pounds of milk over herdmates. There are no time trends in these data because bulls from each group were distributed equally over the course of the study.

In each group, there is one sire whose daughters in the Beltsville herd do not conform to expectation based on his Predicted Difference. This is due to the sampling nature of inheritance and is not unusual when a sire has only a few daughters in a single herd. Breeding programs are not built on a single sire, however; and genetic progress is determined by using several bulls over a number of years. Table 10 shows a vivid example of what happens in a herd when sires of different genetic merit are used. Bulls with minus Predicted Differences have daughters that produce less milk than their herdmates. Bulls with moderately plus Predicted Differences have daughters whose average milk production is comparable to their herdmates. Daughters of outstanding sires have the highest average milk production and produce more milk than their herdmates. Daughters of the best group of bulls produced 1,390 pounds more milk than daughters of the sires in group one. This difference could be the difference between profit and loss on many farms.

In summary, the primary changes in USDA procedures for summarizing bulls are concerned with properly accounting for the number of herds, the distribution of daughters in herds, and the number of records per daughter. These procedures will utilize all available information and give it proper weight in estimating breeding value of individual bulls. The other information presented, such as the Repeatability of sire summary, percentage of incomplete first records, and number of herds represented, will serve as additional guidelines to be used in interpreting the estimates of breeding value.

TABLE 1.--Relationships among different methods of proving sires [1]

Method of comparison [2]		Number of bulls	Av. number of daughters per bull		Repeat-ability
I	II		Method I	Method II	
A	B	65	41	260	0.14
A	C	29	41	59	.01
A	D	36	40	689	.13
B	C	23	209	37	.34
B	D	48	228	774	.49
C	D	37	35	560	.42
D	D		20	1,000	.50
			50	1,000	.71
			100	1,000	.83
			1,000	1,000	.98

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[1] These figures are approximations of the data of Meek and Van Vleck (Journal of Dairy Science, Vol. 47, p. 642-645, 1964) and are based on 1 daughter per herd for the USDA comparison.

[2] Comparison made:
A = Non-AI daughter-dam.
B = AI daughter-dam.
C = Non-AI herdmate.
D = USDA AI herdmate.

TABLE 2.--Weights for projecting incomplete records of cows 2 years old and 3 years and older

Age of cows	Months in milk									
	1	2	3	4	5	6	7	8	9	10
2 yrs.old	0.72	0.83	0.88	0.92	0.94	0.96	0.97	0.98	0.99	1.00
3 yrs.old and older	.60	.74	.82	.86	.91	.93	.96	.98	.99	1.00

TABLE 3.--Weights for different number of lactation records

Number of records	Weight
1	1.00
2	1.33
3	1.50
4	1.60
5	1.67
6	1.71

$$w = \frac{NR}{R\ [1 + (N-1)\ R]}$$

TABLE 4.--Changes in standard deviations of Predicted Differences for milk at different Repeatabilities

Number of daughters	Number of herds	Repeat-ability (Pct.)	Expected standard deviations (Lb.)
5	1	13.6	405
10	10	33.3	356
20	20	50.0	308
70	70	77.8	205
200	200	90.9	132
1,000	1,000	98.0	61

TABLE 5.--Effect of distribution of daughters across herds [1]

Basic data:	Milk lb.	Fat lb.
20 daughters' average	16,594	589
Herdmates' average	14,353	518

Distribution of daus. and herds	Repeatability of sire summary	Predicted Difference	
		Milk	Fat
20 [1]	20.9	+489	+5
10, 10 [2]	30.0	+705	+7
7, 7, 6 [3]	35.2	+824	+8
5, 5, 5, 5	38.6	+904	+9
1, 1, ..., 1	50.0	+1,171	+12

[1] 20 daughters in one herd.

[2] 10 daughters in each of two herds.

[3] 7 daughters in each of two herds and 6 daughters in another herd.

TABLE 6.--Repeatability of sire summary as affected by number of daughters, number of herds, and distribution of daughters among herds

Number of daughters	1 daughter per herd		5 daughters per herd		10 daughters per herd		All daughters in a single herd	
	No. of herds	Repeat-ability (Pct.1/)	No. of herds	Repeat-ability (Pct.1/)	No. of herds	Repeat-ability (Pct.1/)	No. of herds	Repeat-ability (Pct.1/)
5	5	20.0	1	13.6	--	----	1	13.6
10	10	33.3	2	23.9	1	17.7	1	17.7
15	15	42.9	3	32.1	--	----	1	19.7
20	20	50.0	4	38.6	2	30.1	1	20.9
25	25	55.6	5	44.0	--	----	1	21.6
30	30	60.0	6	48.6	3	39.2	1	22.1
40	40	66.7	8	55.7	4	46.3	1	22.9
50	50	71.4	10	61.2	5	51.8	1	23.3
70	70	77.8	14	68.8	7	60.1	1	23.9
100	100	83.3	20	75.9	10	68.3	1	24.3
200	200	90.9	40	86.3	20	81.2	1	24.8

1/ Repeatability of sire summary.

TABLE 7.--Example of computation of "Number of effective daughters per herd"

$$\text{Effective daughters} = 1.0 + \frac{\Sigma n_i(n_i-1)}{N}$$

Herd code	No. of daughters (n_i)	(n_i-1)	$\Sigma n_i(n_i-1)$
11-11-0001	16	15	240
16-12-0046	3	2	6
23-59-0087	2	1	2
32-33-9712	1	0	0
55-48-0054	8	7	56
57-25-0014	6	5	30
6 herds [1]	36		334

[1] 36 = N; 334 = $\Sigma n_i (n_i-1)$

Effective daughters per herd

$$= 1.0 + \frac{\Sigma n_i (n_i-1)}{N}$$

$$= 1.0 + \frac{334}{36}$$

$$= 1.0 + 9.28$$

$$= 10.28 \text{ or } = \text{approximately } 10$$

TABLE 8.--Minimum requirements for resummary of bulls in the May USDA production run

Number of daughters in previous summary	Live bulls (including active AI)	Special requests	Bulls of unknown status that are not requested [1]
No previous summary	10 daughters with herdmates	10 daughters with herdmates	10 daughters with herdmates
10-200	Resummarize [2]	Resummarize [2]	One or more new daughters and 10% increase in number of records No new daughters: If registered in 1960 or later, resummarize if 33% increase in number of records If registered before 1960; resummarize if 100% increase in number of records
201 and up	Resummarize [2]	Enough new daughters for 10% increase in Repeatability if each new daughter is in a different herd, or if 50% increase in number of records	Enough new daughters for 10% increase in Repeatability if each new daughter is in a different herd, or if 100% increase in number of records

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[1] Includes dead bulls and inactive AI bulls.
[2] If the bull still has 10 or more daughters in file with herdmates.

TABLE 9.--Requirements for resummary of bulls in the September and January USDA production runs

Number of daughters in previous summary	Live bulls and special requests (including active AI)	Bulls of unknown status that are not requested [1]
No previous summary	10 daughters with herdmates	10 daughters with herdmates
10-200	Must have new data plus a 10% increase in total number of records since last summary[2]	Enough new daughters for 10% increase in Repeatability if each new daughter is in a different herd, or 100% increase in number of records
201-499	Enough new daughters for 10% increase in Repeatability if each new daughter is in a different herd, or 50% increase in number of records	Enough new daughters for 10% increase in Repeatability if each new daughter is in a different herd, or 100% increase in number of records
500 and up	Enough new daughters for 10% increase in Repeatability if each new daughter is in a different herd, or 100% increase in number of records	Enough new daughters for 10% increase in Repeatability if each new daughter is in a different herd, or 100% increase in number of records

[1] Includes dead bulls and inactive AI bulls.

[2] Either a new daughter or a new record since last summary.

TABLE 10.--Performance of sires used in the USDA herd at Beltsville, Maryland

Sire	Predicted Difference	Number of daughters	Average milk production	Difference from herdmates
	Pounds		Pounds	Pounds
1	-649	25	14,590	-1,641
2	-323	16	14,670	-1,358
3	-244	14	16,720	+261
4	-176	14	15,420	-1,111
5	-101	32	16,200	-339
Average	-299	101	15,523	-838
6	+56	22	15,670	+175
7	+132	30	16,160	+61
8	+317	14	15,300	-944
9	+433	8	16,600	+526
10	+485	16	16,550	+616
Average	+284	90	16,259	+87
11	+563	21	16,960	+472
12	+654	8	16,990	+731
13	+957	26	17,700	+1,753
14	+1,077	13	15,900	-58
15	+1,312	14	16,280	+149
Average	+913	82	16,913	+622

APPROXIMATE PROBABILITIES THAT BULLS WITH GIVEN PREDICTED DIFFERENCES AND REPEATABILITIES ARE BREED IMPROVERS

by B. T. McDaniel

Tables 11 and 12 can be used to determine the probabilities that bulls listed in the USDA sire summaries are actually transmitting above breed average production to their daughters. These probabilities are based on the Predicted Difference for milk and its Repeatability. Levels of Predicted Difference in 100-pound increments and selected levels of Repeatability are given in each table. Table 11 gives the probabilities for Ayrshire, Guernsey, and Jersey bulls. Table 12 gives the probabilities for Brown Swiss and Holstein bulls.

As an example of the use of these tables, suppose two Jersey bulls are available: Bull A has +300 Predicted Difference (PD) and 20 percent Repeatability and bull B has +200 PD and 60 percent Repeatability. Table 11 shows that the probability that the bulls will be breed improvers for milk yield is 80 percent for bull A and only 78 percent for bull B. In other words, if 100 bulls have +300 PD and 20 percent Repeatability and 100 bulls have +200 PD and 60 percent Repeatability, we would expect that 80 of the first group and 78 of the second group would be breed improvers. Another important point is that the average of all 100 bulls in the first group is +300 but it is only +200 in the second group.

Dairymen should also remember that in using a series of bulls over a long period of time Predicted Differences primarily determine the genetic improvement such bulls make to their herd. However, the confidence that can be put in any one bull is a function of Repeatability.

If a dairyman is using several bulls in his herd simultaneously, they should be chosen only on Predicted Difference. This is because the true average transmitting ability of all will be near the mean of their Predicted Differences regardless of the Repeatabilities. However, the lower the Repeatability, the more likely that the true transmitting ability will vary from the Predicted Difference. Thus, if he plans to use only one or two bulls, it is important that he consider Repeatability to minimize the probability that the bulls he chooses are poorer than they seem.

TABLE 11.--Approximate probability that an Ayrshire, Jersey, or Guernsey bull 1/ with a given Repeatability and Predicted Difference for milk production has a true genetic merit above breed average

Predicted Difference milk(pounds)	Repeatability 2/												
	15	20	25	30	35	40	45	50	60	70	80	90	95
	Percent												
+1000	99	--	--	--	--	--	--	--	--	--	--	--	--
+900	99	--	--	--	--	--	--	--	--	--	--	--	--
+800	98	99	--	--	--	--	--	--	--	--	--	--	--
+700	97	97	98	98	98	99	--	--	--	--	--	--	--
+600	95	95	96	96	97	97	98	98	99	--	--	--	--
+500	91	92	92	93	94	95	95	96	98	99	--	--	--
+400	86	87	87	88	89	90	91	92	94	97	99	--	--
+300	79	80	81	81	82	83	84	85	88	91	95	99	--
+200	70	71	72	72	73	74	75	76	78	82	87	94	99
+100	60	61	61	61	62	62	63	63	65	67	71	78	87
0	50	50	50	50	50	50	50	50	50	50	50	50	50
-100	39	38	38	38	37	37	36	36	34	32	28	21	12
-200	29	28	27	27	26	25	24	23	21	17	12	5	0
-300	20	19	18	18	17	16	15	14	11	8	4	0	0
-400	13	12	12	11	10	9	8	7	5	2	0	0	0
-500	8	7	7	6	5	4	4	3	1	0	0	0	0
-600	4	4	3	3	2	2	1	1	0	0	0	0	0
-700	2	2	1	1	1	0	0	0	0	0	0	0	0

1/ Assuming the standard deviation among bulls is 400 pounds.

2/ Dashes indicate probability over 99 percent.

TABLE 12.--Approximate probability that a Holstein or Brown Swiss bull 1/ with a given Repeatability and Predicted Difference has a true genetic merit above breed average

Predicted Difference milk(pounds)	Repeatability 2/												
	15	20	25	30	35	40	45	50	60	70	80	90	95
	Percent												
+1000	98	98	98	98	99	--	--	--	--	--	--	--	--
+900	96	97	97	97	98	98	99	--	--	--	--	--	--
+800	94	95	95	96	96	97	97	98	99	--	--	--	--
+700	91	92	93	93	94	95	96	96	98	99	--	--	--
+600	88	89	89	90	91	92	93	94	96	98	99	--	--
+500	84	84	85	86	87	88	89	90	92	95	98	99	--
+400	78	79	80	81	81	82	83	85	87	91	95	99	--
+300	72	73	73	74	75	75	77	78	80	84	89	96	99
+200	65	66	66	66	67	68	68	69	71	74	79	87	95
+100	58	58	58	58	59	59	59	60	61	63	66	71	79
0	50	50	50	50	50	50	50	50	50	50	50	50	50
-100	41	41	41	41	40	40	40	39	38	36	33	28	20
-200	34	33	33	33	32	31	31	30	28	25	20	12	4
-300	27	26	26	25	24	24	22	21	19	15	10	3	0
-400	21	20	19	18	18	17	16	14	12	8	4	0	0
-500	15	15	14	13	12	11	10	9	7	4	1	0	0
-600	11	10	10	9	8	7	6	5	3	1	0	0	0
-700	8	7	6	6	5	4	3	1	0	0	0	0	0

1/ Assuming standard deviation among bulls of 550 pounds.
2/ Dashes indicate probability over 99 percent.

DISTRIBUTION OF ACTIVE AI SIRES SUMMARIZED IN THE JANUARY 1968 USDA-DHIA SIRE SUMMARY BY LEVEL OF PREDICTED DIFFERENCE FOR MILK PRODUCTION OF DAUGHTERS

by F. N. Dickinson, B. T. McDaniel, and A. H. Gardiner

All sires that were in active service as of January 1, 1967, and that were summarized in the January 1968 USDA-DHIA Sire Summary List were categorized separately by breed according to the level of their Predicted Differences (PD) for milk production and the Repeatability of their Predicted Difference. Counts of sires with Repeatability of Predicted Differences of 50 percent or above are shown in table 13; they are categorized by increments of 200 pounds of milk in Predicted Difference. Counts of sires with Repeatability of Predicted Differences of less than 50 percent are shown in table 14, categorized by the same increments. In each table are summarizations, by breed, of averages calculated by weighting all sires of each breed equally, regardless of number of daughters or daughter records.

INTERPRETATION OF DATA

Because of the manner in which Predicted Difference is calculated, a zero Predicted Difference in the tables indicates that a sire has transmitted approximately breed average production to his daughters thus far and will be expected to transmit approximately breed average production to his future progeny. Of course all bulls have some daughters that produce above breed average and some below. But on the average, the daughters of a sire with zero Predicted Difference will be close to breed average. On the average, bulls with negative Predicted Differences will sire daughters that are below breed average in production and bulls with plus Predicted Differences will sire daughters that produce above breed average.

The Repeatability factor is a measure of the confidence or sureness that a sire's Predicted Difference is an exact indication of the level of production that he transmits to his daughters. In other words, the higher the Repeatability of a sire's Predicted Difference, the more certain it is that that sire's Predicted Difference is close to his true transmitting ability for production. If a sire has a large plus Predicted

Difference, +1,000 pounds of milk for instance, and that Predicted Difference has a high Repeatability, let us say 95 percent, the probability is very high that the sire's future daughters will produce, on the average, well above most other cows in the herds in which they are milked. Conversely, a large minus Predicted Difference with a high Repeatability indicates that most of that sire's daughters will produce below the average of the herds in which they are milked. However, because of the adjustments that are made for environmental and genetic effects when calculating Predicted Difference, even proofs with relatively low Repeatability give a fairly reliable indication of whether a sire will transmit above breed average production.

WHAT DO THESE DATA MEAN TO A DAIRYMAN

Dairymen who derive most of their income from the sale of milk should, of course, be using primarily the sires with the high plus Predicted Differences. These tables indicate that the availability of AI sires with plus PD is sufficient in all breeds to fulfill the requirements of the industry for a pool of germ plasm that will assure a steady increase in production in future generations. However, the average Predicted Differences indicate that a great deal more selection for increased production could be practiced. For instance, among the sires with the high Repeatability (table 13) 78 sires in all breeds have Predicted Differences for milk of -400 pounds or below.

The probability that any of these sires actually transmits breed average milk production to his daughters is about 10 percent in Holstein and Brown Swiss and about 4 percent in the other breeds. In both instances an average Repeatability of 65 percent is assumed. The chance that any of these sires will transmit above breed average milk production to his daughters is much smaller. Thus, dairymen using such bulls should understand that they can expect to have the future milk production of their herd lowered from current levels.

Included in this group of 78 sires are 42 bulls with Predicted Differences for milk of -600 pounds or below. Only about 2 percent of the Holstein and Brown Swiss bulls in this category, and essentially no bulls from the other breeds, can be expected to be actually transmitting breed average milk production to their daughters. In other words, dairymen using these sires should be fully aware that they are almost certainly bringing into their herds genetic material that will lower milk production.

At the same time, this group of sires with Repeatabilities of 50 percent or more (table 13) contains 157 sires with Predicted Differences for milk of +400 pounds or more. The probability that these sires transmit above breed average production to their daughters is about 97 percent in Holstein and Brown Swiss and about 99 percent in the other breeds. In other words, the sires in this group will raise milk production in most herds.

Among the sires with Repeatabilities of less than 50 percent (table 14) 16 sires have Predicted Differences for milk of -400 pounds or below. Assuming an average Repeatability of 30 percent for these sires, the probability that any of them transmits breed average milk production to his daughters is about 18 percent in Holstein and Brown Swiss and about 11 percent in the other breeds. The Predicted Differences of these sires will change somewhat as more daughters complete records; the additional records will make their summaries more accurate (and the Repeatability higher). However, it is fairly certain that most of these sires are actually transmitting below breed average milk production to their daughters. On the other hand, of the sires with below 50 percent Repeatability, 83 have Predicted Differences for milk of +400 pounds or above. The probability of these sires transmitting above breed average milk production to their daughters is approximately 81 percent in Holstein and Brown Swiss and about 88 percent in the other breeds. Again, the Predicted Differences on these sires may change as they produce more daughters and the estimate of their true genetic merit for milk production becomes more accurate. However, the odds are very high that most of these sires are transmitting well above breed average milk production to their daughters.

WHAT THESE DATA MEAN TO THE DAIRY INDUSTRY

What does all this mean to the dairy industry and to individual dairymen? It means that dairymen could increase milk production per cow more rapidly than they are. It means that they could eliminate the use of AI sires that are almost certain to decrease production and lower their income. It means that the AI sire population could and should be composed almost entirely of bulls that would raise production while maintaining or improving other inherited characteristics.

TABLE 13.--Average production of milk and butterfat of daughters of sires in artificial-breeding service with 50% or more Repeatability, grouped according to milk production range of the Predicted Difference

Predicted Difference in milk production—range (Pounds)	Sires	Percentage of sires in group	Daughters with herdmates	Records of daughters	Average production						Predicted Diff.	
					Daughters			Herdmates				
					Milk	Butterfat		Milk	Butterfat		Milk	Butterfat
	Number		Number	Number	Pounds	%	Pounds	Pounds	%	Pounds	Pounds	Pounds
				AYRSHIRE								
- 200 TO - 399	2	12.5%	246	358	10,861	4.0	439	11,322	4.0	457	-267	-9
- 1 TO - 199	1	6.3%	211	327	10,804	4.2	449	10,983	4.0	442	-115	7
0 TO 199	4	25.0%	142	235	11,006	4.0	440	10,827	4.0	435	115	4
200 TO 399	4	25.0%	1,005	1,596	11,234	4.0	445	10,947	4.0	438	277	7
400 TO 599	4	25.0%	403	637	11,454	3.9	444	10,855	4.0	432	462	9
600 TO 799	1	6.3%	58	103	12,499	3.9	489	11,305	3.9	445	754	27
TOTAL OR AV. BY SIRE UNWEIGHTED	16		2,065	3,256	11,237	4.0	446	10,965	4.0	439	220	6
WEIGHTED BY NUMBER OF DAUGHTERS			2,065	3,256	11,228	4.0	445	10,948	4.0	438	211	6
				GUERNSEY								
- 400 TO - 599	4	4.8%	707	1,151	8,741	4.9	425	9,518	4.8	[illegible]	-543	-17
- 200 TO - 399	9	10.7%	1,306	2,067	9,296	4.8	451	9,768	4.8	465	-294	-7
- 1 TO - 199	11	13.1%	611	1,007	9,271	4.8	442	9,420	4.8	448	-75	-2
0 TO 199	16	19.0%	1,639	3,168	9,666	4.7	458	9,529	4.7	449	118	7
200 TO 399	26	31.0%	4,753	8,468	9,993	4.7	466	9,658	4.7	458	282	8
400 TO 599	10	11.9%	1,395	2,617	10,430	4.7	485	9,815	4.7	466	503	16
600 TO 799	6	7.1%	2,403	3,605	10,711	4.6	492	10,021	4.7	474	689	20
800 TO 999	2	2.4%	388	702	10,562	4.7	499	9,611	4.7	455	872	42
TOTAL OR AV. BY SIRE UNWEIGHTED	84		13,202	22,785	9,819	4.7	463	9,651	4.7	457	172	6
WEIGHTED BY NUMBER OF DAUGHTERS			13,202	22,785	9,823	4.7	463	9,651	4.7	457	259	9
				HOLSTEIN								
-1000 AND BELOW	7	2.0%	930	1,060	12,686	3.9	491	14,271	3.7	525	-1,214	-24
- 800 TO - 999	10	2.9%	2,941	4,295	13,053	3.7	485	14,158	3.6	513	-865	-20
- 600 TO - 799	17	4.9%	2,050	2,714	13,262	3.8	502	14,439	3.7	528	-704	-13
- 400 TO - 599	23	6.7%	4,120	5,549	13,579	3.7	498	14,356	3.6	523	-489	-14
- 200 TO - 399	40	11.6%	11,503	16,353	13,881	3.7	513	14,380	3.6	523	-294	-5
- 1 TO - 199	53	15.4%	16,815	23,289	14,130	3.6	515	14,354	3.6	523	-90	-2
0 TO 199	38	11.0%	7,953	12,076	14,445	3.6	522	14,425	3.6	524	90	2
200 TO 399	46	13.3%	9,962	17,202	14,624	3.6	527	14,336	3.6	522	294	7
400 TO 599	46	13.3%	11,597	16,763	15,018	3.6	540	14,476	3.6	526	502	13
600 TO 799	23	6.7%	4,857	7,264	15,189	3.6	547	14,405	3.6	522	696	22
800 TO 999	23	6.7%	8,659	12,759	15,603	3.6	556	14,645	3.6	534	890	22
1000 AND UP	19	5.5%	4,330	6,105	15,885	3.5	561	14,497	3.7	530	1,203	28
TOTAL OR AV. BY SIRE UNWEIGHTED	345		85,717	125,429	14,446	3.6	525	14,406	3.6	524	123	4
WEIGHTED BY NUMBER OF DAUGHTERS			85,717	125,429	14,466	3.6	525	14,410	3.6	524	160	5
				JERSEY								
- 800 TO - 999	1	1.3%	82	113	7,212	5.3	382	8,357	5.1	425	-877	-32
- 600 TO - 799	5	6.3%	1,043	1,285	7,987	5.3	422	8,916	5.1	452	-634	-19
- 400 TO - 599	1	1.3%	37	42	8,504	5.2	440	9,227	5.1	473	-411	-17
- 200 TO - 399	8	10.1%	977	1,585	8,058	5.1	411	8,508	5.1	430	-292	-12
- 1 TO - 199	15	19.0%	1,839	3,353	8,657	5.1	444	8,814	5.1	452	-85	-3
0 TO 199	13	16.5%	1,616	2,834	8,784	5.2	454	8,714	5.1	445	75	8
200 TO 399	21	26.6%	4,790	7,638	9,383	5.0	469	9,103	5.1	463	265	8
400 TO 599	8	10.1%	1,162	2,344	9,414	5.0	471	8,828	5.1	450	493	18
600 TO 799	4	5.1%	469	866	9,765	5.0	487	8,743	5.2	452	712	25
800 TO 999	2	2.5%	231	484	10,828	4.8	522	9,856	5.1	499	824	22
1000 AND UP	1	1.3%	36	73	10,903	5.2	565	9,318	5.2	489	1,123	55
TOTAL OR AV. BY SIRE UNWEIGHTED	79		12,282	20,617	8,964	5.1	455	8,880	5.1	453	102	5
WEIGHTED BY NUMBER OF DAUGHTERS			12,282	20,617	8,976	5.1	456	8,878	5.1	453	108	5

TABLE 13.--Average production of milk and butterfat of daughters of sires in artificial-breeding service with 50% or more Repeatability, grouped according to milk production range of the Predicted Difference--Continued

Predicted Difference in milk production—range (Pounds)	Sires	Percentage of sires in group	Daughters with herdmates	Records of daughters	Average production						Predicted Diff.	
					Daughters			Herdmates				
					Milk	Butterfat		Milk	Butterfat		Milk	Butterfat
	Number		Number	Number	Pounds	%	Pounds	Pounds	%	Pounds	Pounds	Pounds
				BROWN SWISS								
- 600 TO - 799	2	6.3%	137	219	10,736	4.1	441	11,768	4.1	478	-659	-23
- 400 TO - 599	8	25.0%	770	1,125	11,235	4.1	465	11,955	4.1	486	-475	-12
- 200 TO - 399	6	18.8%	880	1,572	11,654	4.2	486	12,169	4.1	496	-336	-4
- 1 TO - 199	2	6.3%	145	189	12,301	4.1	510	12,533	4.1	516	-99	
0 TO 199	3	9.4%	846	1,200	12,405	4.0	501	12,304	4.1	500	99	3
200 TO 399	4	12.5%	676	1,183	12,937	4.1	525	12,604	4.1	520	281	7
400 TO 599	1	3.1%	50	58	12,824	4.1	524	12,218	4.2	514	422	9
600 TO 799	3	9.4%	265	633	13,284	4.0	529	12,274	4.1	503	712	20
800 TO 999	1	3.1%	60	74	14,458	4.0	578	13,381	4.1	553	875	23
1000 AND UP	2	6.3%	130	261	13,488	4.0	534	12,153	4.1	495	1,075	32
TOTAL OR AV. BY SIRE												
UNWEIGHTED	32		3,959	6,514	12,155	4.1	497	12,240	4.1	500	-10	1
WEIGHTED BY NUMBER OF DAUGHTERS			3,959	6,514	12,165	4.1	497	12,232	4.1	499	-23	1
				M. SHORTHORN								
400 TO 599	1	100.0%	22	42	10,314	3.8	392	9,390	3.8	353	478	20
TOTAL OR AV. BY SIRE												
UNWEIGHTED	1		22	42	10,314	3.8	392	9,390	3.8	353	478	20
WEIGHTED BY NUMBER OF DAUGHTERS			22	42	10,314	3.8	392	9,390	3.8	353	478	20
				RED DANE								
0 TO 199	2	66.7%	94	151	12,719	3.9	496	12,792	3.9	502	36	1
200 TO 399	1	33.3%	75	152	13,282	3.9	514	12,885	3.9	504	360	10
TOTAL OR AV. BY SIRE												
UNWEIGHTED	3		169	303	12,906	3.9	502	12,823	3.9	502	144	4
WEIGHTED BY NUMBER OF DAUGHTERS			169	303	12,919	3.9	503	12,826	3.9	502	180	5

TABLE 14.--Average production of milk and butterfat of daughters of sires in artificial-breeding service with 49% or less Repeatability, grouped according to milk production range of the Predicted Difference

Predicted Difference in milk production—range (Pounds)	Sires	Percentage of sires in group	Daughters with herdmates	Records of daughters	Average production: Daughters: Milk	Daughters: Butterfat	Daughters: Butterfat	Herdmates: Milk	Herdmates: Butterfat	Herdmates: Butterfat	Predicted Diff.: Milk	Predicted Diff.: Butterfat
	Number		Number	Number	Pounds	%	Pounds	Pounds	%	Pounds	Pounds	Pounds
AYRSHIRE												
1 TO - 199	1	10.0%	7	7	11,877	3.9	466	12,073	4.0	481	-7	-1
0 TO 199	1	10.0%	29	53	11,615	4.1	471	11,404	4.0	453	124	6
200 TO 399	4	40.0%	54	89	13,269	3.8	498	11,980	3.9	469	314	7
400 TO 599	4	40.0%	70	143	14,258	4.0	568	12,391	4.0	493	518	21
TOTAL OR AV. BY SIRE UNWEIGHTED	10		160	292	13,360	3.9	520	12,096	4.0	478	345	12
WEIGHTED BY NUMBER OF DAUGHTERS			160	292	13,355	3.9	520	12,096	4.0	478	355	13
GUERNSEY												
- 400 TO - 599	2	3.3%	40	41	9,620	5.2	500	10,992	5.0	545	-458	-14
- 200 TO - 399	2	3.3%	38	46	9,449	4.9	459	10,137	4.6	467	-220	-1
- 1 TO - 199	12	19.7%	284	572	9,976	4.8	477	10,396	4.8	494	-100	-3
0 TO 199	18	29.5%	373	706	10,772	4.8	518	10,546	4.8	506	113	6
200 TO 399	18	29.5%	338	575	11,661	4.8	554	10,838	4.8	519	287	13
400 TO 599	5	8.2%	89	152	12,615	4.7	590	10,371	4.9	505	503	18
600 TO 799	3	4.9%	37	70	14,063	4.4	625	11,557	4.6	536	679	24
800 TO 999	1	1.6%	16	33	13,619	4.3	589	10,540	4.4	464	878	35
TOTAL OR AV. BY SIRE UNWEIGHTED	61		1,215	2,195	11,156	4.8	530	10,639	4.8	508	165	8
WEIGHTED BY NUMBER OF DAUGHTERS			1,215	2,195	11,145	4.8	530	10,631	4.8	508	138	7
HOLSTEIN												
- 800 TO - 999	1	.5%	29	38	12,103	4.0	492	14,943	3.7	549	-836	-15
- 600 TO - 799	1	.5%	10	10	12,540	4.0	502	14,798	3.7	541	-663	-10
- 400 TO - 599	6	3.2%	127	166	13,292	3.8	504	14,673	3.6	535	-504	-10
- 200 TO - 399	8	4.3%	125	185	13,591	3.7	506	14,648	3.6	532	-319	-8
- 1 TO - 199	33	17.6%	863	1,597	14,728	3.7	539	15,194	3.6	553	-94	-2
0 TO 199	39	20.7%	1,144	2,102	15,227	3.7	557	15,034	3.7	549	116	5
200 TO 399	47	25.0%	1,180	1,971	16,093	3.7	589	15,366	3.7	565	290	10
400 TO 599	27	14.4%	732	1,274	16,784	3.7	614	15,531	3.7	569	475	16
600 TO 799	16	8.5%	391	723	17,384	3.6	627	15,409	3.6	561	705	23
800 TO 999	7	3.7%	167	298	18,336	3.6	651	16,136	3.6	589	896	25
1000 AND UP	3	1.6%	46	59	19,711	3.4	675	15,656	3.6	563	1,167	32
TOTAL OR AV. BY SIRE UNWEIGHTED	188		4,814	8,423	15,788	3.7	577	15,270	3.7	558	223	8
WEIGHTED BY NUMBER OF DAUGHTERS			4,814	8,423	15,793	3.7	577	15,269	3.7	558	226	8
JERSEY												
- 400 TO - 599	4	6.5%	75	106	7,473	5.2	385	9,002	5.1	457	-463	-20
- 200 TO - 399	2	3.2%	19	21	8,505	5.3	450	9,834	5.0	496	-309	-9
- 1 TO - 199	14	22.6%	283	461	8,975	5.2	463	9,350	5.1	477	-82	-2
0 TO 199	15	24.2%	1,018	1,615	9,777	5.1	497	9,522	5.1	485	107	5
200 TO 399	17	27.4%	493	759	10,492	5.1	538	9,683	5.2	500	280	13
400 TO 599	8	12.9%	222	446	10,916	5.1	562	9,682	5.1	498	470	24
600 TO 799	1	1.6%	9	12	12,306	4.6	564	9,621	5.2	498	696	18
800 TO 999	1	1.6%	15	31	10,325	4.8	499	8,250	5.0	410	943	40
TOTAL OR AV. BY SIRE UNWEIGHTED	62		2,134	3,451	9,799	5.1	501	9,505	5.1	496	131	7
WEIGHTED BY NUMBER OF DAUGHTERS			2,134	3,451	9,853	5.1	504	9,539	5.1	498	144	8

TABLE 14.--Average production of milk and butterfat of daughters of sires in artificial-breeding service with 49% or less Repeatability, grouped according to milk production range of the Predicted Difference--Continued

Predicted Difference in milk production—range (Pounds)	Sires	Percentage of sires in group	Daughters with herdmates	Records of daughters	Average production: Daughters: Milk	Daughters: Butterfat		Herdmates: Milk	Herdmates: Butterfat		Predicted Diff.: Milk	Predicted Diff.: Butterfat
	Number		Number	Number	Pounds	%	Pounds	Pounds	%	Pounds	Pounds	Pounds
					BROWN SWISS							
- 600 TO - 799	1	4.0%	38	85	12,272	4.3	523	14,219	4.0	573	-614	-14
- 400 TO - 599	1	4.0%	21	27	10,887	4.0	435	11,912	4.0	479	-465	-19
- 200 TO - 399	2	8.0%	34	34	11,844	4.1	489	12,407	4.1	513	-211	-8
- 1 TO - 199	2	8.0%	15	16	12,999	4.1	532	13,933	4.2	589	-129	-9
0 TO 199	8	32.0%	128	212	13,212	4.2	552	12,829	4.1	529	118	7
200 TO 399	5	20.0%	99	203	14,117	4.0	564	13,082	4.1	537	318	10
400 TO 599	5	20.0%	155	283	13,714	4.0	553	12,236	4.1	500	524	19
600 TO 799	1	4.0%	15	27	14,877	3.9	577	13,635	4.0	550	609	15
TOTAL OR AV. BY SIRE												
UNWEIGHTED	25		505	887	13,303	4.1	543	12,867	4.1	529	160	6
WEIGHTED BY NUMBER OF DAUGHTERS			505	887	13,351	4.1	545	12,896	4.1	530	188	7
					M. SHORTHORN							
- 200 TO - 399	1	10.0%	5	7	8,277	3.7	305	9,262	3.7	346	-205	-8
1 TO - 199	4	40.0%	54	114	9,087	3.7	339	9,603	3.8	362	-113	-4
0 TO 199	4	40.0%	74	150	10,117	3.6	368	9,567	3.7	354	151	5
200 TO 399	1	10.0%	14	18	10,789	3.5	380	9,734	3.7	360	318	6
OTAL OR AV. Y SIRE												
UNWEIGHTED	10		147	289	9,588	3.7	351	9,567	3.7	357	27	0
WEIGHTED BY NUMBER OF DAUGHTERS			147	289	9,598	3.7	352	9,571	3.7	357	58	1
					RED DANE							
400 TO 599	1	100.0%	43	106	13,948	3.9	542	12,647	3.9	495	506	18
OTAL OR AV. Y SIRE												
UNWEIGHTED	1		43	106	13,948	3.9	542	12,647	3.9	495	506	18
WEIGHTED BY NUMBER OF DAUGHTERS			43	106	13,948	3.9	542	12,647	3.9	495	506	18

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AGRICULTURAL RESEARCH SERVICE
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ARS-44-204
Dairy-Herd-Improvement Letter (Vol. 44, No. 3)

May 1968

ARTIFICIAL INSEMINATION (AI) PARTICIPATION REPORT FOR THE UNITED STATES 1967 [1]

A total of 7,487,607 cows were bred artificially in the United States in 1967. Of these, 7,048,358 were dairy cows and 649,161 were beef cows. Not categorized were 150,088 first services reported as State totals only. Semen from dairy bulls was used to inseminate 6,259,425 dairy cows. Semen from beef bulls was used to inseminate 788,933 dairy cows in addition to the beef animals. These dairy animals bred to beef bulls represented 11.2 percent of the 7,048,358 dairy cattle bred artificially.

Because of incomplete reporting and the lack of information, the tabular data in this report are partly estimations. Where possible, estimates were based on the averages and percentages from complete reports. Where only the number of ampules of semen used were available, the number of first services were estimated to be one-half of the number of ampules reported.

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[1] Prepared by B. T. McDaniel, C. A. Rampendahl, R. D. Plowman, and J. J. Corbin from data supplied by artificial insemination organizations, State Extension Dairymen, and the National Association of Animal Breeders.

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Table 1 shows that 48.1 percent of the Nation's 14,662,000 dairy cows and heifers were artificially inseminated in 1967. About 1.8 percent of the Nation's beef cows and heifers were artificially inseminated in the same period. Approximately 12 percent, or 844,280, of the dairy cattle so bred were registered.

The top 10 States in number and percentage of dairy and beef cattle bred artificially are shown in table 2. Wisconsin had the highest number of dairy cows, and Montana the highest number of beef cattle.

A comparison of the scope of artificial insemination by State for the years 1966 and 1967 is shown in table 3. The greatest increase in the number of dairy cows bred occurred in Wisconsin, and Montana had the greatest advance in beef cattle.

The number of cows bred artificially in the United States since 1939 is shown by year in table 4. The continual upward trend in the percentage of dairy cattle bred artificially is illustrated in figure 1.

Table 5 shows that 33 organizations bred cows artificially in 1967. These organizations serviced an estimated 458,782 herds. However, it should be noted that a herd was counted more than once when two or more AI studs bred cows in the same herd. It is estimated that 311,060 cows were bred by semen sold to individual farmers by the studs, and that 27,036 cows were bred by semen custom-frozen in addition to the 7,509,511 cattle serviced directly by their technicians.

Three organizations reported that they artificially inseminated 7,955 swine, which is 2,688 or 51.0 percent more than in 1966. Services to only 73 goats were indicated, a drop of 24.7 percent from 1966.

A total of 2,380 bulls were in AI studs in 1967. This probably exceeds the number of bulls actually in service in 1967, because it includes all bulls reported in studs at any time in 1967. It was possible to remove bulls without services from the counts only in cases where the stud reported an actual

TABLE 1.--Status of artificial breeding in the United States, January 1, 1968

State and other sources	Studs 1/	Bred to dairy sires in 1967		Bred to beef sires in 1967		Services reported as State totals only 3/	Dairy cattle		Beef cattle	
		Registered dairy cows 2/	Total dairy cows	Dairy cows	Beef cows		All U.S. milk cows 4/	Dairy cows bred as a percentage of all milk cows 5/	Other U.S. cattle and calves 2 years and older 6/	Beef cows bred as a percentage of other cattle and calves 7/
	Number	Number	Number	Number	Number	Number	Thousands	Percent	Thousands	Percent
Alabama--------	0	3,660	39,617	5,635	3,650	148	166	27.3	863	0.4
Alaska---------	1	198	1,172	17	9	-----	2	59.5	2	.4
Arizona--------	0	868	9,376	851	5,033	2,131	55	18.6	376	1.3
Arkansas-------	0	2,581	20,250	3,167	4,264	3,997	114	20.5	845	.5
California-----	4	24,595	365,261	26,709	19,014	-----	857	45.7	1,005	1.9
Colorado-------	0	2,759	32,318	2,788	7,264	483	106	33.1	979	.7
Connecticut----	0	8,702	46,071	4,327	140	-----	77	65.5	4	3.5
Delaware-------	0	2,752	7,816	1,236	94	-----	17	53.2	4	2.4
Florida--------	0	13,426	143,297	22,063	15,294	50	189	87.5	846	1.8
Georgia--------	0	8,754	55,907	5,756	5,862	290	155	39.8	787	.7
Hawaii---------	0	897	9,634	1,013	1,480	175	16	66.5	89	1.7
Idaho----------	0	7,234	56,576	7,446	9,353	8,430	166	38.6	528	1.8
Illinois-------	1	26,628	166,138	23,991	17,576	505	386	49.3	782	2.2
Indiana--------	0	12,422	98,992	11,538	12,870	1,377	285	38.8	422	3.0
Iowa-----------	0	23,780	196,391	32,914	23,002	-----	650	35.3	1,360	1.7
Kansas---------	1	11,107	83,631	7,305	37,493	1,278	240	37.9	1,710	2.2
Kentucky-------	0	11,875	105,519	16,825	14,658	3,987	421	29.1	956	1.5
Louisiana------	1	9,521	64,680	7,658	8,465	480	206	35.1	883	1.0
Maine----------	0	8,615	45,493	5,023	94	225	79	63.9	10	.9
Maryland-------	1	11,668	74,783	9,857	2,521	-----	186	45.5	54	4.7
assachusetts--	0	8,000	41,945	4,858	232	50	80	58.5	4	5.8
ichigan-------	2	46,922	266,679	28,593	6,361	13,641	519	56.9	116	5.5
innesota------	1	32,742	538,224	73,605	15,362	18,712	1,181	51.8	518	3.0
ississippi----	1	5,871	52,275	4,175	8,138	-----	245	23.0	1,204	.7
issouri-------	0	14,645	118,832	12,157	19,907	8,438	429	30.5	1,779	1.1
ontana--------	0	1,159	9,623	1,849	53,435	-----	51	22.5	1,525	3.5
ebraska-------	0	3,080	41,054	4,392	22,386	7,880	235	19.3	1,964	1.1
evada---------	0	763	4,415	661	2,109	-----	15	33.8	305	.7
ew Hampshire--	0	4,128	22,856	2,654	155	-----	45	56.7	2	7.8
ew Jersey-----	0	12,379	50,703	6,612	350	1,031	90	63.7	7	5.0
ew Mexico-----	0	2,437	24,574	1,734	891	178	40	65.8	696	.1
ew York-------	1	118,833	650,386	77,092	2,895	7,533	1,172	62.1	54	5.4
orth Carolina-	1	11,549	82,654	10,384	7,571	3,100	214	43.5	314	2.4
orth Dakota---	0	874	17,208	2,573	19,999	-----	183	10.8	956	2.1
hio-----------	2	48,982	255,065	40,968	17,916	8,237	535	55.3	333	5.4
klahoma-------	1	2,202	17,901	2,293	12,137	13,029	171	11.8	1,923	.6
regon---------	0	6,671	57,279	8,274	10,637	4,250	126	52.0	680	1.6
ennsylvania---	3	120,070	470,012	65,323	10,120	10,000	823	65.0	98	10.3
uerto Rico----	1	3,001	56,346	3,261	200	-----	---	----	---	---
hode Island---	0	1,492	4,324	467	54	-----	10	47.9	1	5.4
outh Carolina-	0	4,023	30,960	4,634	4,586	25	82	43.4	237	1.9
outh Dakota---	0	2,013	30,100	3,782	16,135	5,925	225	15.1	1,638	1.0
ennessee------	3	9,852	84,645	17,815	8,832	4,995	375	27.3	874	1.0
exas----------	0	5,083	93,556	4,925	36,437	9,903	406	24.3	5,304	.7
tah-----------	1	6,438	47,569	4,829	4,549	-----	81	64.7	319	1.4
ermont--------	0	20,427	114,561	13,575	398	1,072	236	54.3	4	10.0
irginia-------	1	10,593	102,101	13,468	4,800	1,053	264	43.8	466	1.0
ashington-----	2	12,178	108,198	14,717	16,928	7,320	210	58.5	384	4.4
est Virginia--	0	2,231	19,123	5,165	2,531	-----	77	31.5	183	1.4
sconsin------	4	132,930	1,214,622	156,650	20,799	-----	2,147	63.9	208	10.0
oming--------	0	670	4,513	1,329	9,883	160	22	26.6	699	1.4
eported AI ctivity, but tate unknown 8/	-	------	4,200	------	16,329	-----	---	----	---	---
ternational eef Breeders 9/	-	------	------	------	48,335	-----	---	----	---	---
men services eported from anchers' ulls 9/------	-	------	------	------	59,628	-----	---	----	---	---
nited States-	33	844,280	6,259,425	788,933	649,161	150,088	14,662	48.1	35,300	1.8

1/ States without studs purchase semen from studs in other States. See table 7 for name and location of studs.

2/ Data for registered cows may have been all or partially estimated when incomplete report was given.

3/ These are total first services by State as reported by Carnation Farms Breeding Service.

4/ Preliminary figures for number of cows and heifers 2 years old and over kept for milk; estimated by the Statistical porting Service (USDA).

5/ Percentage of all dairy cows bred included in the artificial insemination program.

6/ Preliminary figures for other cattle and calves 2 years and older; estimated by the Statistical Reporting Service (USDA).

7/ Percentage of all beef cows bred in the artificial insemination program.

8/ AI breeding activity reported for: Curtiss, 3,000 cows; NEBA, 20 cows; Mississippi ABC, 1,700 cows; Select Sires, 14,771 vs; Virginia ABA, 1,038 cows. Total: 20,529 cows. Data were received from studs and NAAB (see footnote 9 for name and address NAAB).

9/ Information obtained from National Association of Animal Breeders, P.O. Box 1033, Columbia, Missouri 65201.

TABLE 2.--States with the highest number and percentage of dairy and beef cows bred artificially in 1967

DAIRY COWS

Rank	State	Cows bred artificially	Rank	State	Cows bred artificially
		Number			Percent
1	Wisconsin	1,371,272	1	Florida	87.5
2	New York	727,478	2	Hawaii	66.5
3	Minnesota	611,829	3	New Mexico	65.8
4	Pennsylvania	535,335	4	Connecticut	65.5
5	California	391,970	5	Pennsylvania	65.0
6	Ohio	296,033	6	Utah	64.7
7	Michigan	295,272	7	Maine	63.9
8	Iowa	229,305	8	Wisconsin	63.9
9	Illinois	190,129	9	New Jersey	63.7
10	Florida	165,360	10	New York	62.1
		BEEF COWS			
1	Montana	53,435	1	Pennsylvania	10.3
2	Kansas	37,493	2	Vermont	10.0
3	Texas	36,437	3	Wisconsin	10.0
4	Iowa	23,002	4	New Hampshire	7.8
5	Nebraska	22,386	5	Massachusetts	5.8
6	Wisconsin	20,799	6	Michigan	5.5
7	North Dakota	19,999	7	New York	5.4
8	Missouri	19,907	8	Ohio	5.4
9	California	19,014	9	Rhode Island	5.4
10	Ohio	17,916	10	New Jersey	5.0

TABLE 3.--Comparison of artificial breeding in the United States for years 1966 and 1967

State	Dairy cows bred artificially in--				Beef cows bred artificially in--			
	1966	1967	Increase or decrease	Increase or decrease 1/	1966	1967	Increase or decrease	Increase or decrease 2/
	Number	Number	Number	Percent	Number	Number	Number	Percent
Alabama-----------	47,254	45,252	-2,002	+0.6	2,189	3,650	+1,461	+0.1
Alaska------------	783	1,189	+406	+22.2	------	9	+9	+.4
Arizona-----------	19,036	10,227	-8,809	-15.4	6,863	5,033	-1,830	-.5
Arkansas----------	27,632	23,417	-4,215	-1.6	3,614	4,264	+650	+.1
California--------	389,725	391,970	+2,245	-.6	15,153	19,014	+3,861	+.4
Colorado----------	35,228	35,106	-122	+.2	5,747	7,264	+1,517	+.1
Connecticut-------	49,499	50,398	+899	+1.2	596	140	-456	-11.4
Delaware----------	8,685	9,052	+367	+4.9	150	94	-56	-2.6
Florida-----------	135,132	165,360	+30,228	+16.0	11,783	15,294	+3,511	+.5
Georgia-----------	58,051	61,663	+3,612	+4.2	4,474	5,862	+1,388	+.1
Hawaii------------	7,262	10,647	+3,385	+21.1	1,312	1,480	+168	+.2
Idaho-------------	77,411	64,022	-13,389	-6.7	6,825	9,353	+2,528	+.5
Illinois----------	210,676	190,129	-20,547	-1.0	22,465	17,576	-4,889	-.8
Indiana-----------	132,024	110,530	-21,494	-2.1	13,555	12,870	-685	-.2
Iowa--------------	161,337	229,305	+67,968	+12.5	29,350	23,002	-6,348	-.5
Kansas------------	88,053	90,936	+2,883	+2.0	44,298	37,493	-6,805	-.5
Kentucky----------	129,854	122,344	-7,510	-1.1	15,899	14,658	-1,241	-.3
Louisiana---------	70,038	72,338	+2,300	+2.5	10,987	8,465	-2,522	-.2
Maine-------------	49,185	50,516	+1,331	0	92	94	+2	-.1
Maryland----------	85,829	84,640	-1,189	+.3	2,306	2,521	+215	+.3
Massachusetts-----	50,590	46,803	-3,787	-6.4	823	232	-591	-14.8
Michigan----------	317,169	295,272	-21,897	+.8	8,280	6,361	-1,919	-1.2
Minnesota---------	627,419	611,829	-15,590	+.8	12,046	15,362	+3,316	+.4
Mississippi-------	51,967	56,450	+4,483	+3.1	5,023	8,138	+3,115	+.3
Missouri----------	141,986	130,989	-10,997	-.9	18,771	19,907	+1,136	0
Montana-----------	13,640	11,472	-2,168	-2.3	33,966	53,435	+19,469	+1.2
Nebraska----------	46,833	45,446	-1,387	+.3	22,117	22,386	+269	-.1
Nevada------------	4,089	5,076	+987	+6.5	1,444	2,109	+665	+.2
New Hampshire-----	26,574	25,510	-1,064	-2.4	116	155	+39	+2.0
New Jersey--------	58,461	57,315	-1,146	+6.9	447	350	-97	-2.5
New Mexico--------	25,683	26,308	+625	+3.2	1,182	891	-291	-.1
New York----------	726,527	727,478	+951	+1.4	3,347	2,895	-452	-1.3
North Carolina----	90,857	93,038	+2,181	+3.1	7,918	7,571	-347	-.2
North Dakota------	26,543	19,781	-6,762	-2.1	15,053	19,999	+4,946	+.6
Ohio--------------	308,083	296,033	-12,050	0	22,295	17,916	-4,379	-1.7
Oklahoma----------	23,938	20,194	-3,744	-2.0	7,564	12,137	+4,573	+.2
Oregon------------	66,552	65,553	-999	+1.6	5,736	10,637	+4,901	+.7
Pennsylvania------	558,560	535,335	-23,225	-.9	10,499	10,120	-379	0
Puerto Rico-------	50,712	59,607	+8,895	-----	------	200	+200	----
Rhode Island------	4,412	4,791	+379	+3.8	3	54	+51	+5.1
South Carolina----	33,182	35,594	+2,412	+3.4	3,822	4,586	+764	+.3
South Dakota------	33,090	33,882	+792	+.7	10,200	16,135	+5,935	+.4
Tennessee---------	97,343	102,460	+5,117	+2.7	19,420	8,832	-10,588	-1.2
Texas-------------	104,750	98,481	-6,269	-.7	29,697	36,437	+6,740	+.1
Utah--------------	52,789	52,398	-391	+1.1	4,126	4,549	+423	+.1
Vermont-----------	121,418	128,136	+6,718	+2.2	771	398	-373	-9.3
Virginia----------	113,809	115,569	+1,760	+2.0	7,021	4,800	-2,221	-.5
Washington--------	141,864	122,915	-18,949	-6.9	9,608	16,928	+7,320	+1.9
West Virginia-----	24,212	24,288	+76	+2.0	2,507	2,531	+24	0
Wisconsin---------	1,280,240	1,371,272	+91,032	+5.2	19,408	20,799	+1,391	0
Wyoming-----------	6,143	5,842	-301	-1.3	9,271	9,883	+612	0
AI activity reported by studs, but State unknown 3/-------	274,451	4,200	-270,251	----	13,156	16,329	+3,173	----
International Beef Breeders 3/-	-------	-------	-------	----	49,175	48,335	-840	----
Semen services reported from ranchers' bulls 3/---------	-------	-------	-------	----	94,673	59,628	-35,045	----
United States 4/--	7,286,580	7,048,358	-238,222	+.2	647,143	649,161	+2,018	-.1

1/ Derived from all dairy cows bred in the artificial insemination program as a percentage of all milk cows in the United States.

2/ Derived from all beef cows bred in the artificial insemination program as a percentage of other cattle and calves 2 years and older in the United States.

3/ For year 1967, see table 1 and footnotes. For year 1966, see table 1 and footnotes in the April 1967 Dairy Herd Improvement Letter covering the Artificial Insemination Participation Report for 1966.

4/ Does not include breakdown of 150,088 first services reported by Carnation Farms Breeding Service. See table 1 for services reported as State totals only.

TABLE 4.--Status of artificial breeding program in the United States (1939-1968, inclusive)

Year	Studs	Sires in service				Herds1/	Dairy cows bred to-		Beef cows bred to beef bulls	Total cattle bred	Cows bred per sire
		Dairy	Beef	Total	Average per stud		Dairy bulls	Beef bulls			
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
1939	7	--	--	33	4.7	646	--	--	--	7,359	228
1940	25	--	--	138	5.5	2,971	--	--	--	33,977	246
1941	35	--	--	237	6.8	5,997	--	--	--	70,751	299
1942	46	--	--	412	9.0	12,118	--	--	--	112,788	274
1943	59	--	--	574	9.7	23,448	--	--	--	182,524	318
1944	56	--	--	657	11.7	28,627	--	--	--	218,070	332
1945	67	--	--	729	10.9	43,998	--	--	--	360,732	495
1946	78	--	--	900	11.5	73,293	--	--	--	537,376	597
1947	84	--	--	1,453	17.3	140,571	--	--	--	1,184,168	815
1948	91	--	--	1,745	19.2	224,493	--	--	--	1,713,581	982
1949	90	--	--	1,940	21.6	316,177	--	--	--	2,091,175	1,078
1950	97	--	--	2,104	21.7	409,300	--	--	--	2,619,555	1,245
1951	94	--	--	2,187	23.3	548,300	--	--	--	3,509,573	1,605
1952	94	--	--	2,324	24.7	671,100	--	--	--	4,295,243	1,848
1953	96	--	--	2,598	27.1	755,000	--	--	--	4,845,222	1,865
1954	93	--	--	2,661	28.6	805,000	--	--	--	5,155,240	1,937
1955	79	--	--	2,450	31.0	845,900	--	--	--	5,413,874	2,210
1956	79	--	--	2,553	32.3	900,400	--	--	--	5,762,656	2,257
1957	75	--	--	2,651	35.3	946,000	--	--	--	6,055,982	2,284
1958	71	--	--	2,676	37.7	975,372	--	--	--	6,645,568	2,483
1959	64	--	--	2,460	38.4	930,059	--	--	--	6,932,294	2,816
1960	62	--	--	2,544	41.0	910,000	--	--	--	7,144,679	2,808
1961	56	--	--	2,486	44.4	863,781	7,047,148	2/435,592	--	7,482,740	3,010
1962	56	2,036	420	2,456	43.9	862,150	6,837,681	2/911,006	--	7,748,687	3,155
1963	51	2,158	401	2,559	50.2	621,141	6,468,545	969,748	235,289	7,673,582	2,999
1964	50	2,140	398	2,538	50.8	654,311	6,165,599	1,117,395	464,959	7,747,953	3,053
1965	3/46	1,867	449	2,316	50.3	591,859	6,301,178	963,657	615,147	7,879,982	3,402
1966	3/44	1,949	439	2,388	54.3	540,265	6,413,453	873,127	647,143	7,933,723	3,322
1967	35	2,012	364	2,376	67.9	458,782	6,259,425	788,933	649,161	4/5/7,847,607	3,303
1968	3/33	2,028	352	2,380	72.1	--	--	--	--	--	--

1/ Prior to 1963, number of herds largely reflected membership rather than those actually serviced.
2/ Probably includes some beef to beef inseminations.
3/ Includes one all-beef stud.
4/ Not shown are inseminations to 7,955 swine and 73 goats.
5/ Total cattle bred in 1967 includes 150,088 first services, by State only, where breakdowns were not reported.

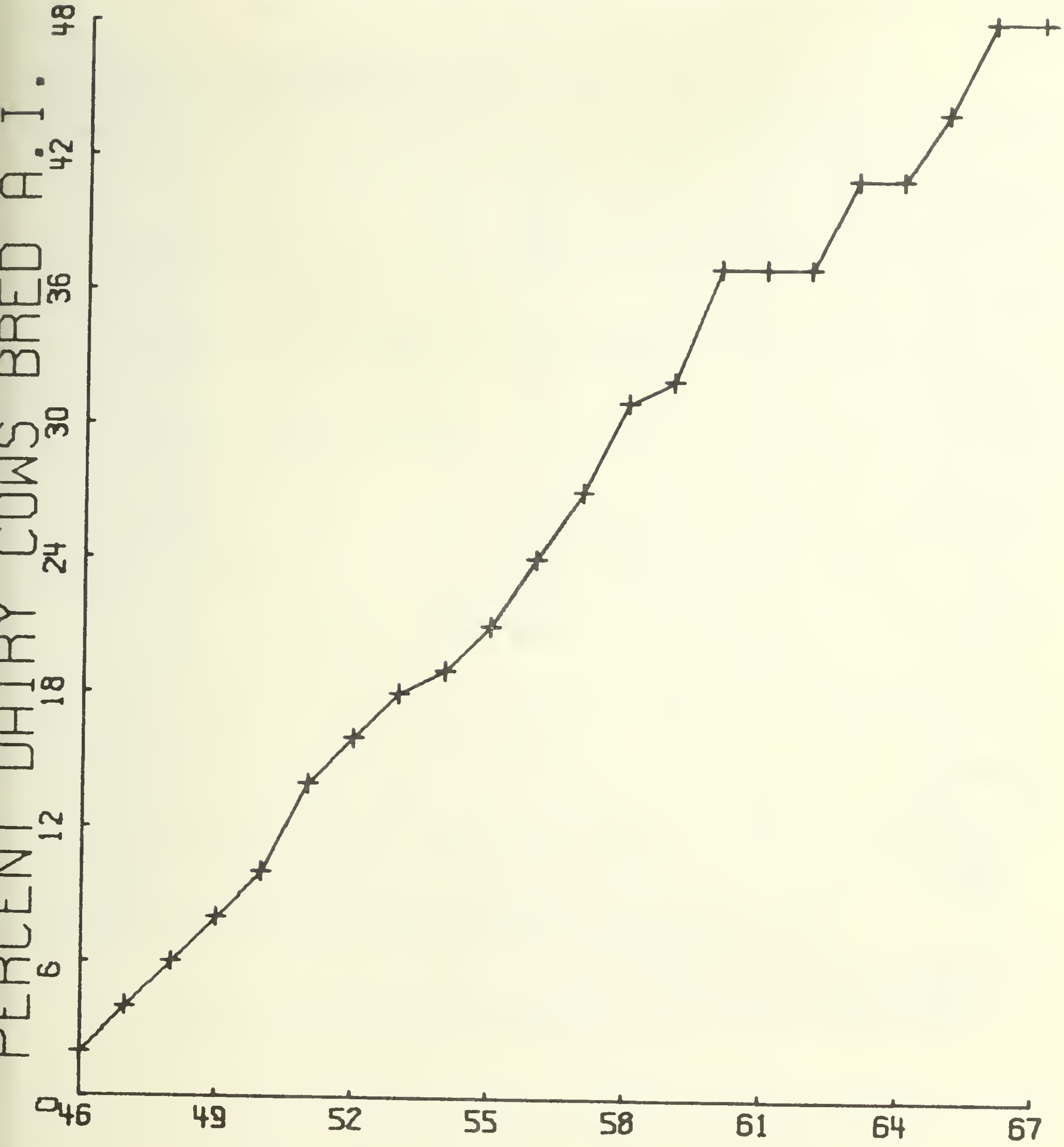


FIGURE 1.--Yearly trends in the percentage of U.S. dairy cows bred artificially since 1946.

TABLE 5.--Cows bred in artificial-breeding organization bull studs during 1967

Stud code	Name of stud 1/	Herds serviced	Cows bred in 1967								Estimated total number of cows bred	Total bulls used 2/	Insemina-tions of--	
			First services				Semen transactions							
							Semen sales		Custom-frozen					
			Dairy total	Dairy to beef	Beef to beef	Total first services	Dairy to dairy	Beef to beef	Dairy to dairy	Beef to beef			Swine	Goats
		Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	----	Number	-----
2110	Eastern AIC-------	37,141	656,071	76,968	818	733,857	5,230	252	-----	-----	739,339	316	----	--
2301	Zimmerman---------	3/44	700	------	-----	700	-----	------	-----	-----	700	4	----	--
2309	Atlantic----------	15,341	190,273	27,559	5,718	223,550	350	50	-----	-----	223,950	71	----	28
2311	NEBA--------------	12,377	168,723	23,529	1,250	193,502	928	------	300	-----	194,730	97	----	6
3102	NOBA--------------	3/10,384	210,971	39,094	9,837	259,902	5,960	67	-----	-----	265,929	75	----	5
3303	Curtiss-----------	49,300	995,391	130,010	65,000	1,190,401	-----	------	-----	3,000	1,193,401	187	----	--
3401	Michigan ABC------	3/13,481	189,447	21,876	4,366	215,689	1,019	------	-----	-----	216,708	84	----	--
3407	General Genetics--	3/1,425	21,800	800	200	22,800	425	225	-----	-----	23,450	---	----	--
3503	East Central------	4,500	77,414	13,000	500	90,914	7,284	------	-----	-----	98,198	42	----	--
3505	Tri-State---------	19,503	376,394	47,199	7,757	431,350	17,578	173	3,013	-----	452,114	91	7,716	2
3521	Midwest Breeders--	43,179	578,586	78,823	22,167	679,576	56,436	14,108	-----	-----	750,120	140	----	--
3575	ABS---------------	3/95,893	1,235,845	135,431	163,008	1,534,284	-----	------	-----	-----	1,534,284	363	----	--
4101	Minnesota Valley--	41,472	275,712	42,778	4,754	323,244	300	8,100	-----	-----	331,644	147	----	--
4801	Kansas ABSU-------	3,000	41,710	2,854	21,141	65,705	2,651	10,330	-----	-----	78,686	41	----	12
5102	Maryland-W. Va----	4,550	69,508	12,338	4,157	86,003	2,509	3,103	-----	-----	91,615	61	----	6
5201	Virginia ABA------	7,220	63,634	9,241	1,842	74,717	3,001	1,925	-----	-----	79,643	32	----	--
5501	N.C. Inst. B.P----	12	964	------	-----	964	63	------	-----	-----	1,027	17	----	--
6102	Select Sires------	3/37,658	271,999	46,699	42,923	361,621	86,793	30,946	325	10,398	490,083	173	233	14
6301	East Tennessee----	7,600	20,030	3,860	2,679	26,569	770	115	-----	-----	27,454	26	----	--
6302	Tennessee ABA-----	6,000	22,792	9,083	800	32,675	2,200	------	-----	-----	34,875	27	----	--
6303	West Tennessee----	1,470	4,706	780	2,304	7,790	-----	------	-----	-----	7,790	21	----	--
6502	Mississippi ABC---	300	19,850	2,700	2,000	24,550	5,000	100	-----	-----	29,650	12	----	--
7201	Louisiana ABC-----	5,769	60,587	7,503	7,008	75,098	1,450	1,080	-----	-----	77,628	36	----	--
8701	Cache Valley------	6,580	59,631	3/8,681	3/33,911	102,223	-----	9,157	-----	-----	111,380	52	----	--
9111	Carnation---------	3/11,055	137,942	25,694	13,236	176,872	-----	------	-----	-----	4/326,960	90	----	--
9113	All West----------	19,142	136,870	21,189	21,729	179,788	-----	------	-----	-----	179,788	70	----	--
9302	Adohr-------------	7	3,456	------	-----	3,456	2,558	------	-----	-----	6,014	17	----	--
9303	Excelsior---------	163	23,884	150	50	24,084	9,249	25	-----	-----	33,358	28	----	--
9310	Pacific-----------	500	25,559	892	580	27,031	2,125	------	-----	-----	29,156	34	----	--
9316	Genetics, Inc-----	3/3,316	51,874	185	1,000	53,059	10,000	1,000	9,900	100	74,059	14	----	--
9401	P.R. AI Center----	350	28,338	------	200	28,538	-----	------	-----	-----	28,538	9	6	--
9601	Matanuska Valley--	50	922	3/17	3/9	948	-----	------	-----	-----	948	3	----	--
Report by individual dairyman---------------		------	-------	------	-----	-------	425	------	-----	-----	425	---	----	--
STUDS OR RANCHERS SERVICING ONLY BEEF CATTLE														
7304	C.H.Codding & Sons	------	-------	------	-----	-------	-----	6,000	-----	-----	6,000	---	----	--
8406	International Beef Breeders 5/------	------	-------	------	48,335	48,335	-----	------	-----	-----	48,335	---	----	--
	Semen services reported from ranchers' bulls 5/---------	------	-------	------	59,628	59,628	-----	------	-----	-----	59,628	---	----	--
United States-----------		458,782	6,021,583	788,933	548,907	7,359,423	224,304	86,756	13,538	13,498	7,847,607	2,380	7,955	73

1/ See table 7 for list of names and addresses of studs.
2/ See table 6 for breakdown of bulls by stud, by breed.
3/ Data may have been all or partially estimated when incomplete report was given.
4/ Includes 150,088 first services, by State only, for which breakdowns were not reported.
5/ Information obtained from National Association of Animal Breeders, P. O. Box 1033, Columbia, Missouri 65201.

or estimated number of services by each individual bull.

The distribution of the 2,028 dairy bulls by type of service and breed is shown in table 6. About 54 percent of the dairy bulls were available in regular service, 37 percent were involved in progeny testing only, and the remaining 8 percent were available only on a special service basis. Only 1,596 of the dairy bulls were reported as having semen available on January 1, 1968. Most of the 352 beef bulls were reported as in regular service.

Table 7 lists artificial breeding organizations active in 1967.

The accompanying map illustrates the AI density in the United States in 1967.

Shown on the last page is an updated list of Extension Dairymen in charge of AI activity in each State.

MAY 1968 SIRE SUMMARY RESULTS

Included in tables 8 through 14 are the results of the May 1968 sire summary. The first two show the distribution of Repeatability on bulls summarized by breed, and by number and percent, respectively. Table 10 is a breakdown of new and updated summaries of bulls, by breed. Tables 11 through 14 are grouped by breed, showing ranges of the Predicted Differences of active AI bulls according to 50 percent or more Repeatability or 49 percent or less Repeatability.

TABLE 6.--Bulls used in artificial-breeding organization bull studs during 1967

Stud code	Name of stud 1/	Bulls by breed 2/									Type of service by dairy bulls		
		Ayrshire	Brown Swiss	Guernsey	Holstein	Jersey	Red Dane	Shorthorn	Beef	Total	Regular	Special or planned mating	Progeny testing
		Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
2110	Eastern AIC-------	15	11	33	203	45	--	--	9	316	89	27	191
2301	Zimmerman---------	--	--	--	4	--	--	--	--	4	4	--	---
2309	Atlantic----------	2	3	13	33	5	--	--	15	71	55	1	---
2311	NEBA--------------	5	4	14	60	9	--	--	5	97	65	4	23
3102	NOBA--------------	--	4	13	35	17	--	--	6	75	37	13	19
3303	Curtiss-----------	6	6	15	89	14	--	3	54	187	125	4	4
3401	Michigan ABC------	--	2	10	53	7	4	3	5	84	33	13	33
3407	General Genetics--	--	--	--	--	--	--	--	--	---	---	--	---
3503	East Central------	--	1	3	32	--	--	--	6	42	25	11	---
3505	Tri-State---------	--	2	19	49	4	--	2	15	91	40	22	14
3521	Midwest Breeders--	--	9	15	94	3	--	3	16	140	66	13	45
3575	ABS---------------	3	4	11	278	16	--	1	50	363	87	21	205
4101	Minnesota Valley--	5	5	14	93	2	--	5	23	147	64	5	55
4801	Kansas ABSU-------	2	3	2	23	3	--	2	6	41	25	1	9
5102	Maryland-W. Va----	5	4	8	31	7	--	--	6	61	29	--	26
5201	Virginia ABA------	1	--	6	17	6	--	--	2	32	14	1	15
5501	N.C. Instit. B.P--	--	--	--	17	--	--	--	--	17	3	6	8
6102	Select Sires------	3	15	21	92	17	--	4	21	173	76	--	76
6301	East Tennessee----	--	1	4	7	6	--	--	8	26	17	1	---
6302	Tennessee ABA-----	--	2	4	8	8	--	--	5	27	22	--	---
6303	West Tennessee----	--	--	--	8	5	--	--	8	21	13	--	---
6502	Mississippi ABC---	--	--	1	2	7	--	--	2	12	9	1	---
7201	Louisiana ABC-----	--	--	8	11	8	--	--	9	36	8	7	12
8701	Cache Valley------	--	1	1	25	3	--	--	22	52	13	6	11
9111	Carnation---------	1	5	8	44	5	--	2	3/25	90	59	6	---
9113	All West----------	--	--	12	29	16	--	--	3/13	70	54	2	1
9302	Adohr-------------	--	--	7	10	--	--	--	--	17	17	--	---
9303	Excelsior---------	--	1	--	27	--	--	--	--	28	16	3	9
9310	Pacific-----------	--	--	2	6	5	--	--	21	34	13	--	---
9316	Genetics, Inc-----	--	--	1	12	1	--	--	--	14	14	--	---
9401	P.R. AI Center----	--	--	--	9	--	--	--	--	9	9	--	---
9601	Matanuska Valley--	--	--	--	3	--	--	--	--	3	2	1	---
	United States-----------	48	83	245	1,404	219	4	25	352	2,380	1,103	169	756

1/ See table 7 for list of names and addresses of studs.

2/ These counts are based on where bulls are housed and does not reflect the fact that they are available to more than one stud.

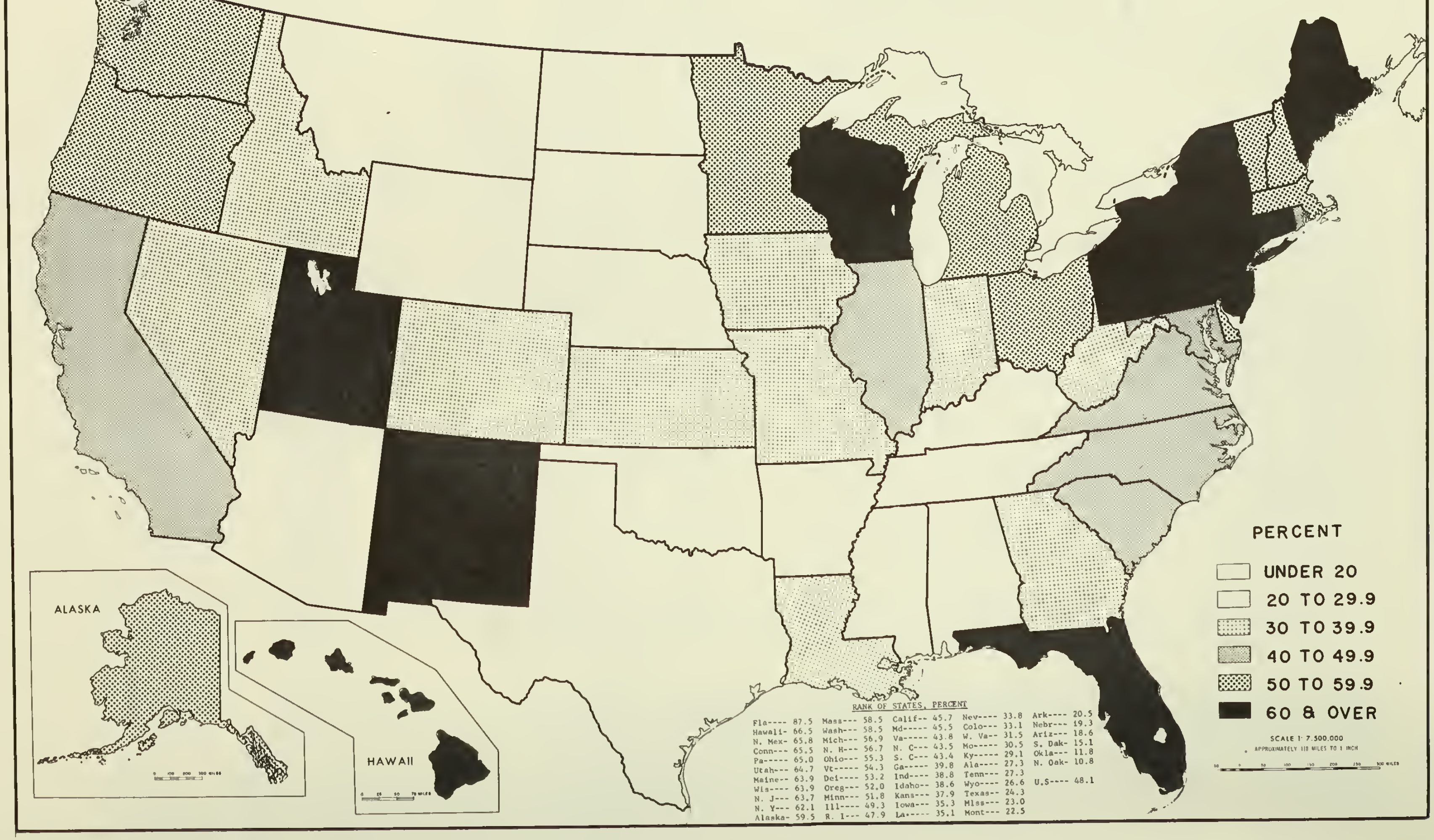
3/ Based on report of January 1, 1967.

TABLE 7.--Artificial-breeding organization bull studs in the United States

State	Stud code	Name and address
Alaska	9601	Matanuska Valley Breeders Association, Palmer 99645.
California	9302	Adohr Farms Inseminating Service, P.O. Box 88, Camarillo 93010.
	9303	Excelsior Breeding Service, 7401 Adams, Rt. 1, Box 128, Corona 91720.
	9316	Genetics, Inc., P.O. Box 134, Hughson 95326.
	1/9310	Pacific Breeders Co-op., Inc., 1464 Middle Two Rock Road, Petaluma 94952.
Illinois	3303	Curtiss Breeding Service, Inc., Cary 60013.
Kansas	4801	Kansas ABS Unit, Kansas State University, Anderson Hall, Manhattan 66502.
Louisiana	7201	La. Animal Breeders Co-op., Inc., Louisiana State University, Box BD, Baton Rouge 70803.
Maryland	5102	Maryland-West Virginia Bull Stud, Inc., Box 555, Frederick 21701.
Michigan	3407	General Genetics, P.O. Box 23, Jenison 49428.
	3401	Michigan Animal Breeders Co-op., Inc., P.O. Box 511, East Lansing 48824.
Minnesota	4101	Minnesota Valley Breeders Association, New Prague 56071.
Mississippi	6502	Mississippi Animal Breeders Co-op., Drawer BA, State College 39762.
New York	2110	Eastern Artificial Insemination Co-op., Inc., P.O. Box 518, Ithaca 14850.
North Carolina	5501	N.C. Institutional Breeding Association, Department of Animal Science, North Carolina State University, Raleigh 27600.
Ohio	3102	NOBA, Inc., P.O. Box 607, Tiffin 44883.
	6102	Select Sires, Inc., 1224 Alton-Darby Road, Columbus 43228.
Pennsylvania	2309	Atlantic Breeders Co-op., Rt. 230 By-Pass, Lancaster 17604.
	2311	Northeastern Breeders Association, Inc., R.D. 2, Tunkhannock 18657.
	2301	Zimmerman Dairy Farm, Rt. 2, Lehighton 18235.
Puerto Rico	9401	Puerto Rico Artificial Insemination Center, Inc., P.O. Box 958, Dorado 00646.
Tennessee	6301	East Tennessee ABA, Rt. 10, Tipton Station Road, Knoxville 37920.
	6302	Tennessee Artificial Breeding Association, Rt. 2, Granny White Pike, Brentwood 37027.
	6303	West Tennessee ABA, P.O. Box 38, Yorkville 38389.
Utah	8701	Cache Valley Breeding Association, 1950 North Main, Logan 84321.
Virginia	5201	Virginia Animal Breeders Association, Inc., P.O. Drawer 370, Rocky Mount 24151.
Washington	9113	All West Breeders, P.O. Box 197, Burlington 98233.
	9111	Carnation Farms Breeding Service, Carnation 98014.
isconsin	3575	American Breeders Service, Inc., De Forest 53532.
	3503	East Central Breeders Association Co-op., P.O. Box 191, Waupun 53963.
	3521	Midwest Breeders Co-op., P.O. Box 469, Shawano 54166.
	3505	Tri-State Breeders Co-op., Westby 54667.
LL-BEEF STUDS		
olorado	8406	International Beef Breeders, Inc., P.O. Box 29007, Denver 80229.
klahoma	7304	C. H. Codding and Sons, Foraker 74638.

1/ Merged with Genetics, Inc.,in 1967 and no longer an active stud.

DAIRY COWS BRED ARTIFICIALLY, 1967



RANK OF STATES, PERCENT

Fla----	87.5	Mass---	58.5	Calif--	45.7	Nev----	33.8	Ark----	20.5
Hawaii-	66.5	Wash---	58.5	Md-----	45.5	Colo---	33.1	Nebr---	19.3
N. Mex-	65.8	Mich---	56.9	Va-----	43.8	W. Va--	31.5	Ariz---	18.6
Conn---	65.5	N. H---	56.7	N. C---	43.5	Mo-----	30.5	S. Dak-	15.1
Pa-----	65.0	Ohio---	55.3	S. C---	43.4	Ky-----	29.1	Okla---	11.8
Utah---	64.7	Vt-----	54.3	Ga-----	39.8	Ala----	27.3	N. Dak-	10.8
Maine--	63.9	Del----	53.2	Ind----	38.8	Tenn---	27.3		
Wis----	63.9	Oreg---	52.0	Idaho--	38.6	Wyo----	26.6	U.S----	48.1
N. J---	63.7	Minn---	51.8	Kans---	37.9	Texas--	24.3		
N. Y---	62.1	Ill----	49.3	Iowa---	35.3	Miss---	23.0		
Alaska-	59.5	R. I---	47.9	La-----	35.1	Mont---	22.5		

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TABLE 8 .--Number of bulls summarized in May 1968 with various repeatabilities

Percentage group	Breed of sire								
	Ayrshire	Guernsey	Holstein	Jersey	Brown Swiss	M.Shorthorn	Red Dane	Red Poll	Total
	Number								
17 to 19--	21	70	299	56	11	5	--	--	462
20 to 29--	174	881	2,926	712	175	30	1	2	4,901
30 to 39--	115	584	1,755	450	122	24	1	--	3,051
40 to 49--	46	292	771	221	58	14	--	--	1,402
50 to 59--	27	136	349	107	47	8	1	--	675
60 to 69--	19	103	224	73	30	4	2	--	455
70 to 79--	16	119	182	100	51	--	--	--	468
80 to 89--	20	155	306	132	48	2	--	--	663
90 to 99--	6	38	263	19	14	--	--	--	340
Total---	444	2,378	7,075	1,870	556	87	5	2	12,417

TABLE 9 .--Percentage of bulls summarized in May 1968 with various repeatabilities

Percentage group	Breed of sire								
	Ayrshire	Guernsey	Holstein	Jersey	Brown Swiss	M.Shorthorn	Red Dane	Red Poll	Total
	Percent								
17 to 19--	4.73	2.94	4.23	2.99	1.98	5.75	-----	-----	3.72
20 to 29--	39.19	37.05	41.36	38.07	31.47	34.48	20.00	100.0	39.47
30 to 39--	25.90	24.56	24.81	24.06	21.94	27.59	20.00	-----	24.57
40 to 49--	10.36	12.28	10.90	11.82	10.43	16.09	-----	-----	11.29
50 to 59--	6.08	5.72	4.93	5.72	8.45	9.20	20.00	-----	5.44
60 to 69--	4.28	4.33	3.17	3.90	5.40	4.60	40.00	-----	3.66
70 to 79--	3.60	5.00	2.57	5.35	9.17	-----	-----	-----	3.77
80 to 89--	4.50	6.52	4.33	7.06	8.63	2.30	-----	-----	5.34
90 to 99--	1.35	1.60	3.72	1.02	2.52	-----	-----	-----	2.74
Total---	99.99	100.00	100.02	99.99	99.99	100.01	100.00	100.0	100.00

TABLE 10.--Sire summaries from May 1968

Breed	New summaries					Updated summaries				Total
	Bulls in AI studs--			Bulls not in AI studs	Total new summaries	Bulls in AI studs--		Bulls not in AI studs	Total updated summaries	
	With 10 or more AI daus.	With less than 10 AI daus.	Bulls in AI studs w/out AI daus.			With AI daus.	W/out AI daus.			
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
Ayrshire----	--	2	--	4	6	78	8	352	438	444
Guernsey----	3	9	3	4	19	515	40	1,804	2,359	2,378
Holstein----	26	21	6	51	104	966	145	5,860	6,971	7,075
Jersey------	--	6	4	9	19	390	42	1,419	1,851	1,870
Brown Swiss-	--	2	2	3	7	186	11	352	549	556
M.Shorthorn-	1	2	1	--	4	22	4	57	83	87
Red Dane----	--	--	--	--	--	4	---	1	5	5
Red Poll----	--	--	--	--	--	--	---	2	2	2
Total--	30	42	16	71	159	2,161	250	9,847	12,258	12,417

TABLE 11.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 50% or more Repeatability, grouped according to milk production range of the Predicted Difference

AYRSHIRE

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
- 200 TO - 399	3	20.0%	510	791	10,882	4.1	443	11,287	4.0	454	-263	-5
0 TO 199	5	33.3%	2,398	5,704	11,359	4.0	456	11,212	4.0	448	136	8
200 TO 399	2	13.3%	799	1,036	11,590	3.8	443	11,264	4.0	447	292	-2
400 TO 599	3	20.0%	384	646	11,597	3.8	445	10,974	4.0	435	500	9
600 TO 799	1	6.7%	61	121	12,427	3.9	483	11,264	3.9	443	752	26
1000 AND UP	1	6.7%	1,511	2,861	13,180	3.9	519	11,540	3.9	453	1,678	67
TOTAL OR AV. BY SIRE UNWEIGHTED	15		5,663	11,159	11,535	3.9	456	11,212	4.0	446	294	10
WEIGHTED BY NUMBER OF DAUGHTERS			5,663	11,159	11,542	3.9	456	11,207	4.0	446	302	10

GUERNSEY

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
- 400 TO - 599	3	5.1%	366	475	8,648	4.8	414	9,492	4.7	445	-497	-16
- 200 TO - 399	4	6.8%	839	1,688	9,461	4.8	457	9,995	4.8	476	-322	-9
- 1 TO - 199	7	11.9%	340	583	9,662	4.8	465	9,929	4.8	474	-117	-2
0 TO 199	11	18.6%	1,260	2,143	9,827	4.7	462	9,712	4.7	461	118	3
200 TO 399	19	32.2%	3,765	7,646	10,067	4.7	469	9,723	4.7	457	280	11
400 TO 599	11	18.6%	5,210	8,910	10,286	4.6	476	9,686	4.7	459	511	15
600 TO 799	4	6.8%	1,328	1,887	10,842	4.5	493	10,077	4.7	473	720	21
TOTAL OR AV. BY SIRE UNWEIGHTED	59		13,108	23,332	9,954	4.7	467	9,769	4.7	462	195	7
WEIGHTED BY NUMBER OF DAUGHTERS			13,108	23,332	9,956	4.7	467	9,769	4.7	462	197	7

HOLSTEIN

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
-1000 AND BELOW	2	.6%	177	181	12,963	3.8	497	14,569	3.7	537	-1,147	-24
- 800 TO - 999	4	1.3%	465	747	13,328	3.7	499	14,683	3.6	531	-893	-20
- 600 TO - 799	11	3.5%	1,774	2,465	13,758	3.8	519	14,777	3.6	539	-667	-10
- 400 TO - 599	21	6.8%	12,384	21,700	13,767	3.7	506	14,506	3.6	528	-495	-12
- 200 TO - 399	31	10.0%	17,043	28,249	14,023	3.7	515	14,499	3.6	527	-303	-5
- 1 TO - 199	35	11.3%	13,142	20,648	14,175	3.7	519	14,392	3.6	522	-106	1
0 TO 199	47	15.2%	17,364	30,020	14,485	3.6	528	14,422	3.6	525	115	5
200 TO 399	48	15.5%	17,245	32,649	14,925	3.6	532	14,520	3.6	528	300	6
400 TO 599	41	13.2%	19,127	33,669	15,003	3.6	542	14,487	3.6	527	486	15
600 TO 799	29	9.4%	11,593	18,526	15,454	3.6	554	14,703	3.6	533	677	20
800 TO 999	23	7.4%	12,737	20,053	15,536	3.5	550	14,512	3.6	529	895	20
1000 AND UP	18	5.8%	4,918	7,486	16,013	3.5	565	14,704	3.7	537	1,209	28
TOTAL OR AV. BY SIRE UNWEIGHTED	310		127,969	216,393	14,683	3.6	532	14,522	3.6	528	210	7
WEIGHTED BY NUMBER OF DAUGHTERS			127,969	216,393	14,696	3.6	533	14,522	3.6	528	219	7

TABLE 11.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 50% or more Repeatability, grouped according to milk production range of the Predicted Difference--Continued

JERSEY

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
- 600 TO - 799	3	5.7%	589	808	7,893	5.1	406	8,739	5.0	440	-677	-26
- 400 TO - 599	1	1.9%	142	248	8,714	5.3	459	9,395	5.1	478	-458	-10
- 200 TO - 399	4	7.5%	484	643	8,346	5.1	425	8,792	5.1	450	-314	-17
- 1 TO - 199	6	11.3%	1,283	2,399	8,464	5.1	431	8,543	5.1	434	-60	-3
0 TO 199	14	26.4%	2,833	5,328	9,186	5.1	472	9,109	5.1	468	101	7
200 TO 399	14	26.4%	2,964	4,931	9,441	5.0	474	9,118	5.1	467	287	8
400 TO 599	5	9.4%	548	1,048	9,794	5.0	488	9,152	5.1	464	504	20
600 TO 799	4	7.5%	378	810	9,995	4.9	494	8,927	5.1	458	739	27
800 TO 999	1	1.9%	136	248	10,614	4.9	516	9,706	5.1	493	868	25
1000 AND UP	1	1.9%	38	79	10,930	5.2	567	9,361	5.2	491	1,129	56
TOTAL OR AV. BY SIRE												
UNWEIGHTED	53		9,395	16,542	9,204	5.1	466	9,014	5.1	461	166	6
WEIGHTED BY NUMBER OF DAUGHTERS			9,395	16,542	9,218	5.1	467	9,013	5.1	461	178	7

BROWN SWISS

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
- 400 TO - 599	10	41.7%	1,621	2,448	11,560	4.1	479	12,232	4.1	498	-486	-12
- 200 TO - 399	1	4.2%	44	107	11,005	4.1	454	11,539	4.0	467	-363	-8
1 TO - 199	2	8.3%	1,906	3,564	12,230	4.1	498	12,331	4.1	501	-55	0
0 TO 199	4	16.7%	272	447	12,747	4.1	521	12,727	4.0	512	66	9
200 TO 399	3	12.5%	729	1,268	12,729	4.0	514	12,456	4.1	514	266	3
400 TO 599	1	4.2%	57	79	13,210	3.9	519	12,443	4.1	510	585	9
600 TO 799	1	4.2%	70	95	13,969	4.0	555	13,136	4.1	541	718	15
800 TO 999	1	4.2%	60	157	13,468	4.2	566	12,205	4.1	500	995	53
1000 AND UP	1	4.2%	89	139	13,651	3.7	504	12,185	4.0	492	1,220	11
OTAL OR AV. Y SIRE												
UNWEIGHTED	24		4,848	8,304	12,273	4.1	500	12,365	4.1	503	-31	0
WEIGHTED BY NUMBER OF DAUGHTERS			4,848	8,304	12,274	4.1	501	12,359	4.1	503	-24	1

M. SHORTHORN

EDICTED FFERENCE LK NGE UNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
400 TO 599	1	100.0%	23	43	10,341	3.8	392	9,426	3.8	354	474	20
TAL OR AV. SIRE												
NWEIGHTED	1		23	43	10,341	3.8	392	9,426	3.8	354	474	20
EIGHTED BY NUMBER OF DAUGHTERS			23	43	10,341	3.8	392	9,426	3.8	354	474	20

RED DANE

DICTED FERENCE K GE NDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
1 TO - 199	2	66.7%	99	161	12,641	3.9	492	12,824	3.9	502	-81	-4
00 TO 399	1	33.3%	75	154	13,246	3.9	513	12,890	3.9	504	260	7
AL OR AV. SIRE												
WEIGHTED	3		174	315	12,842	3.9	499	12,846	3.9	503	33	0
IGHTED BY NUMBER OF DAUGHTERS			174	315	12,860	3.9	499	12,848	3.9	503	42	0

TABLE 12.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 50% or more Repeatability, grouped according to butterfat production range of the Predicted Difference

AYRSHIRE

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION						PREDICTED DIFF.	
					DAUGHTERS			HERD MATES				
					MILK POUNDS	BUTTERFAT %	BUTTERFAT POUNDS	MILK POUNDS	BUTTERFAT %	BUTTERFAT POUNDS	MILK POUNDS	BUTTERFAT POUNDS
-10 TO -19	2	13.3%	968	1,267	11,395	3.9	442	11,561	4.0	459	-50	-11
- 1 TO - 9	2	13.3%	89	143	10,692	4.0	423	10,842	4.0	435	-89	-6
0 TO 9	5	33.3%	498	847	11,361	3.9	446	11,022	4.0	438	249	6
10 TO 19	4	26.7%	2,536	5,920	11,609	4.0	469	11,364	4.0	455	252	14
20 TO 29	1	6.7%	61	121	12,427	3.9	483	11,264	3.9	443	752	26
60 AND UP	1	6.7%	1,511	2,861	13,180	3.9	519	11,540	3.9	453	1,678	67
TOTAL OR AV. BY SIRE UNWEIGHTED	15		5,663	11,159	11,535	3.9	456	11,212	4.0	446	294	10
WEIGHTED BY NUMBER OF DAUGHTERS			5,663	11,159	11,542	3.9	456	11,207	4.0	446	302	10

GUERNSEY

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION						PREDICTED DIFF.	
					DAUGHTERS			HERD MATES				
					MILK POUNDS	BUTTERFAT %	BUTTERFAT POUNDS	MILK POUNDS	BUTTERFAT %	BUTTERFAT POUNDS	MILK POUNDS	BUTTERFAT POUNDS
-20 TO -29	1	1.7%	26	44	7,657	4.7	357	8,605	4.6	395	-584	-23
-10 TO -19	5	8.5%	617	948	9,558	4.7	447	10,068	4.7	477	-237	-15
- 1 TO - 9	11	18.6%	1,398	2,668	9,576	4.7	447	9,669	4.7	457	-44	-4
0 TO 9	16	27.1%	5,100	8,771	9,835	4.6	456	9,620	4.7	453	189	4
10 TO 19	18	30.5%	2,639	4,506	10,354	4.7	486	9,912	4.7	470	392	15
20 TO 29	6	10.2%	3,093	5,995	10,290	4.7	489	9,756	4.7	463	473	23
30 TO 39	2	3.4%	235	400	10,528	4.9	515	10,096	4.7	475	429	35
TOTAL OR AV. BY SIRE UNWEIGHTED	59		13,108	23,332	9,954	4.7	467	9,769	4.7	462	195	7
WEIGHTED BY NUMBER OF DAUGHTERS			13,108	23,332	9,956	4.7	467	9,769	4.7	462	197	7

HOLSTEIN

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION						PREDICTED DIFF.	
					DAUGHTERS			HERD MATES				
					MILK POUNDS	BUTTERFAT %	BUTTERFAT POUNDS	MILK POUNDS	BUTTERFAT %	BUTTERFAT POUNDS	MILK POUNDS	BUTTERFAT POUNDS
-40 TO -49	2	.6%	1,957	2,793	13,234	3.5	463	14,096	3.7	516	-718	-45
-30 TO -39	5	1.6%	3,016	3,875	13,724	3.6	488	14,722	3.6	535	-651	-32
-20 TO -29	11	3.5%	1,608	2,063	14,051	3.6	502	14,817	3.6	540	-445	-23
-10 TO -19	28	9.0%	11,946	19,577	13,946	3.6	500	14,406	3.6	522	-276	-14
- 1 TO - 9	54	17.4%	17,572	31,848	14,349	3.6	516	14,494	3.6	527	-20	-5
0 TO 9	79	25.5%	39,768	67,593	14,511	3.6	524	14,355	3.6	522	188	4
10 TO 19	71	22.9%	27,505	46,042	14,992	3.6	544	14,624	3.6	531	368	14
20 TO 29	32	10.3%	8,543	15,257	15,283	3.7	558	14,579	3.6	530	622	24
30 TO 39	16	5.2%	12,188	21,092	15,534	3.7	582	14,771	3.7	544	679	35
40 TO 49	9	2.9%	2,737	4,278	15,862	3.7	588	14,714	3.7	540	1,033	43
50 TO 59	2	.6%	896	1,452	15,149	3.8	579	14,402	3.7	528	791	52
60 AND UP	1	.3%	233	523	15,306	3.9	593	14,578	3.6	532	763	60
TOTAL OR AV. BY SIRE UNWEIGHTED	310		127,969	216,393	14,683	3.6	532	14,522	3.6	528	210	7
WEIGHTED BY NUMBER OF DAUGHTERS			127,969	216,393	14,696	3.6	533	14,522	3.6	528	219	7

TABLE 12.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 50% or more Repeatability, grouped according to butterfat production range of the Predicted Difference--Continued

JERSEY

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
-40 TO -49	1	1.9%	106	149	7,964	5.0	396	8,926	5.1	454	-707	-42
-30 TO -39	1	1.9%	264	303	8,491	4.9	419	8,950	5.2	461	-381	-34
-20 TO -29	1	1.9%	364	520	7,600	5.1	386	8,385	5.0	418	-714	-29
-10 TO -19	7	13.2%	1,047	1,700	8,834	5.0	444	9,104	5.1	466	-165	-12
- 1 TO - 9	9	17.0%	1,968	3,739	8,934	5.0	444	8,969	5.1	455	4	-5
0 TO 9	11	20.8%	2,783	4,832	9,005	5.0	452	8,806	5.1	447	184	4
10 TO 19	11	20.8%	1,621	3,091	9,511	5.1	482	9,109	5.1	466	329	14
20 TO 29	7	13.2%	638	1,160	9,791	5.2	505	9,256	5.2	478	427	23
30 TO 39	3	5.7%	510	855	9,516	5.3	502	8,856	5.2	461	485	33
40 TO 49	1	1.9%	56	114	9,853	5.3	523	9,263	5.1	473	494	41
50 TO 59	1	1.9%	38	79	10,930	5.2	567	9,361	5.2	491	1,129	56
TOTAL OR AV. BY SIRE UNWEIGHTED	53		9,395	16,542	9,204	5.1	466	9,014	5.1	461	166	6
WEIGHTED BY NUMBER OF DAUGHTERS			9,395	16,542	9,218	5.1	467	9,013	5.1	461	178	7

BROWN SWISS

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
-20 TO -29	2	8.3%	93	135	11,201	4.1	457	12,124	4.0	491	-569	-20
-10 TO -19	5	20.8%	818	1,163	11,652	4.0	469	12,121	4.1	492	-335	-16
- 1 TO - 9	5	20.8%	1,886	2,905	11,771	4.1	488	12,252	4.1	498	-363	-5
0 TO 9	5	20.8%	1,231	2,587	12,590	4.0	506	12,372	4.0	501	180	5
10 TO 19	6	25.0%	760	1,357	13,102	4.1	535	12,766	4.1	523	330	13
50 TO 59	1	4.2%	60	157	13,468	4.2	566	12,205	4.1	500	995	53
TOTAL OR AV. BY SIRE UNWEIGHTED	24		4,848	8,304	12,273	4.1	500	12,365	4.1	503	-31	0
WEIGHTED BY NUMBER OF DAUGHTERS			4,848	8,304	12,274	4.1	501	12,359	4.1	503	-24	1

M.SHORTHORN

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
20 TO 29	1	100.0%	23	43	10,341	3.8	392	9,426	3.8	354	474	20
TOTAL OR AV. BY SIRE UNWEIGHTED	1		23	43	10,341	3.8	392	9,426	3.8	354	474	20
WEIGHTED BY NUMBER OF DAUGHTERS			23	43	10,341	3.8	392	9,426	3.8	354	474	20

RED DANE

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
-10 TO -19	1	33.3%	37	45	12,542	3.8	482	12,814	3.9	506	-124	-11
0 TO 9	2	66.7%	137	270	12,993	3.9	507	12,862	3.9	501	111	5
TOTAL OR AV. BY SIRE UNWEIGHTED	3		174	315	12,842	3.9	499	12,846	3.9	503	33	0
WEIGHTED BY NUMBER OF DAUGHTERS			174	315	12,860	3.9	499	12,848	3.9	503	42	0

TABLE 13.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 49% or less Repeatability, grouped according to milk production range of the Predicted Difference

AYRSHIRE

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION						PREDICTED DIFF.	
					DAUGHTERS			HERD MATES				
					MILK POUNDS	BUTTERFAT %	BUTTERFAT POUNDS	MILK POUNDS	BUTTERFAT %	BUTTERFAT POUNDS	MILK POUNDS	BUTTERFAT POUNDS
200 TO 399	2	28.6%	40	80	13,618	3.7	509	12,800	3.8	491	262	6
400 TO 599	4	57.1%	79	169	13,714	3.9	539	12,095	4.0	482	468	17
600 TO 799	1	14.3%	10	10	14,338	3.9	566	12,086	4.0	483	764	29
TOTAL OR AV. BY SIRE UNWEIGHTED	7		129	259	13,776	3.9	534	12,295	3.9	485	451	15
WEIGHTED BY NUMBER OF DAUGHTERS			129	259	13,741	3.9	534	12,287	3.9	485	447	15

GUERNSEY

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION						PREDICTED DIFF.	
					DAUGHTERS			HERD MATES				
					MILK POUNDS	BUTTERFAT %	BUTTERFAT POUNDS	MILK POUNDS	BUTTERFAT %	BUTTERFAT POUNDS	MILK POUNDS	BUTTERFAT POUNDS
- 400 TO - 599	1	2.0%	29	32	10,529	5.5	583	11,964	5.1	607	-465	-2
- 200 TO - 399	3	6.1%	55	69	9,434	4.8	456	10,128	4.6	468	-236	-2
- 1 TO - 199	10	20.4%	263	470	9,923	4.8	472	10,203	4.7	483	-64	-2
0 TO 199	14	28.6%	282	471	10,759	4.8	517	10,583	4.8	505	105	7
200 TO 399	14	28.6%	323	564	11,439	4.7	542	10,672	4.7	507	284	13
400 TO 599	5	10.2%	107	183	12,905	4.5	580	11,402	4.8	544	529	15
800 TO 999	2	4.1%	30	47	14,424	4.5	644	10,821	4.5	488	888	38
TOTAL OR AV. BY SIRE UNWEIGHTED	49		1,089	1,836	11,065	4.7	524	10,625	4.7	504	164	8
WEIGHTED BY NUMBER OF DAUGHTERS			1,089	1,836	11,045	4.7	524	10,603	4.7	503	168	8

HOLSTEIN

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION						PREDICTED DIFF.	
					DAUGHTERS			HERD MATES				
					MILK POUNDS	BUTTERFAT %	BUTTERFAT POUNDS	MILK POUNDS	BUTTERFAT %	BUTTERFAT POUNDS	MILK POUNDS	BUTTERFAT POUNDS
- 800 TO - 999	1	.6%	32	53	12,236	4.0	494	14,762	3.7	543	-849	-14
- 600 TO - 799	2	1.2%	34	34	12,546	3.7	466	14,281	3.7	524	-648	-19
- 400 TO - 599	8	4.6%	177	259	13,573	3.8	512	14,956	3.7	551	-509	-13
- 200 TO - 399	9	5.2%	132	169	13,554	3.7	504	14,417	3.6	525	-277	-5
- 1 TO - 199	28	16.2%	1,081	2,087	14,790	3.7	541	15,182	3.6	547	-81	0
0 TO 199	35	20.2%	1,060	2,010	15,385	3.7	565	15,195	3.7	557	125	6
200 TO 399	42	24.3%	1,202	1,986	16,444	3.7	604	15,708	3.7	575	304	12
400 TO 599	25	14.5%	646	1,127	16,929	3.6	608	15,640	3.6	570	487	15
600 TO 799	13	7.5%	383	753	17,804	3.6	637	15,904	3.6	580	721	22
800 TO 999	7	4.0%	167	266	18,648	3.7	685	16,056	3.7	591	868	33
1000 AND UP	3	1.7%	76	131	17,724	3.4	597	15,077	3.5	534	1,150	27
TOTAL OR AV. BY SIRE UNWEIGHTED	173		4,990	8,875	15,893	3.7	580	15,403	3.6	562	215	8
WEIGHTED BY NUMBER OF DAUGHTERS			4,990	8,875	15,903	3.7	581	15,399	3.6	562	222	9

TABLE 13.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 49% or less Repeatability, grouped according to milk production range of the Predicted Difference--Continued

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JERSEY

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
- 600 TO - 799	2	4.2%	31	31	7,219	5.4	392	8,913	5.1	458	-677	-24
- 400 TO - 599	1	2.1%	14	18	6,614	5.0	334	8,472	5.2	437	-566	-30
- 200 TO - 399	4	8.3%	111	189	8,565	5.3	451	9,429	5.2	488	-255	-11
- 1 TO - 199	5	10.4%	92	140	8,713	5.0	434	8,947	4.9	441	-58	-1
0 TO 199	16	33.3%	370	644	9,929	5.1	510	9,810	5.2	507	81	4
200 TO 399	12	25.0%	485	778	10,693	5.1	541	9,944	5.1	502	271	14
400 TO 599	7	14.6%	121	211	11,476	5.3	610	9,920	5.2	520	486	27
1000 AND UP	1	2.1%	17	39	10,398	4.8	503	8,354	5.0	416	1,008	43
TOTAL OR AV. BY SIRE												
UNWEIGHTED	48		1,241	2,050	9,933	5.1	511	9,642	5.1	494	119	7
WEIGHTED BY NUMBER OF DAUGHTERS			1,241	2,050	9,973	5.1	513	9,657	5.1	495	131	7

BROWN SWISS

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
0 TO 199	5	35.7%	88	122	13,479	4.2	560	13,264	4.2	554	107	5
200 TO 399	6	42.9%	140	299	14,185	4.0	566	13,289	4.1	541	313	10
400 TO 599	2	14.3%	38	57	13,326	4.0	528	12,245	4.0	492	499	18
800 TO 999	1	7.1%	17	24	14,031	4.0	565	12,256	4.0	491	808	34
TOTAL OR AV. BY SIRE												
UNWEIGHTED	14		283	502	13,799	4.0	559	13,057	4.1	535	302	11
WEIGHTED BY NUMBER OF DAUGHTERS			283	502	13,841	4.0	560	13,086	4.1	536	306	11

M. SHORTHORN

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
- 1 TO - 199	1	14.3%	33	75	9,727	3.7	357	10,280	3.7	384	-130	-6
0 TO 199	3	42.9%	60	121	9,616	3.6	344	9,001	3.7	329	145	4
200 TO 399	1	14.3%	15	24	10,724	3.5	374	9,689	3.7	357	332	6
600 TO 799	1	14.3%	10	25	10,881	3.5	386	9,025	3.6	326	647	21
800 TO 999	1	14.3%	31	71	12,274	3.5	426	9,780	3.5	344	859	28
TOTAL OR AV. BY SIRE												
UNWEIGHTED	7		149	316	10,350	3.6	368	9,397	3.6	343	306	9
WEIGHTED BY NUMBER OF DAUGHTERS			149	316	10,357	3.6	368	9,393	3.6	343	310	9

RED DANE

PREDICTED DIFFERENCE MILK RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
400 TO 599	1	100.0%	44	110	13,938	3.9	541	12,674	3.9	496	453	16
TOTAL OR AV. BY SIRE												
UNWEIGHTED	1		44	110	13,938	3.9	541	12,674	3.9	496	453	16
WEIGHTED BY NUMBER OF DAUGHTERS			44	110	13,938	3.9	541	12,674	3.9	496	453	16

TABLE 14.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 49% or less Repeatability, grouped according to butterfat production range of the Predicted Difference

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AYRSHIRE

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
0 TO 9	2	28.6%	40	80	13,618	3.7	509	12,800	3.8	491	262	6
10 TO 19	2	28.6%	26	53	13,313	3.8	505	11,636	4.0	462	453	12
20 TO 29	3	42.9%	63	126	14,189	4.0	570	12,398	4.0	496	577	24
TOTAL OR AV. BY SIRE UNWEIGHTED	7		129	259	13,776	3.9	534	12,295	3.9	485	451	15
WEIGHTED BY NUMBER OF DAUGHTERS			129	259	13,741	3.9	534	12,287	3.9	485	447	15

GUERNSEY

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
- 1 TO - 9	12	24.5%	269	403	9,939	4.7	469	10,306	4.7	489	-88	-5
0 TO 9	15	30.6%	325	568	10,526	4.7	499	10,394	4.7	492	82	5
10 TO 19	16	32.7%	370	619	12,043	4.7	570	11,156	4.8	533	318	14
20 TO 29	4	8.2%	95	199	10,876	5.0	541	10,223	4.7	482	252	22
30 TO 39	2	4.1%	30	47	14,424	4.5	644	10,821	4.5	488	888	38
TOTAL OR AV. BY SIRE UNWEIGHTED	49		1,089	1,836	11,065	4.7	524	10,625	4.7	504	164	8
WEIGHTED BY NUMBER OF DAUGHTERS			1,089	1,836	11,045	4.7	524	10,603	4.7	503	168	8

HOLSTEIN

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
-20 TO -29	3	1.7%	44	48	13,484	3.5	471	14,868	3.7	548	-456	-26
-10 TO -19	9	5.2%	314	490	13,646	3.7	500	14,962	3.6	542	-451	-13
- 1 TO - 9	25	14.5%	759	1,446	14,427	3.6	525	14,913	3.7	545	-144	-4
0 TO 9	56	32.4%	1,664	2,852	15,880	3.6	570	15,573	3.6	565	170	4
10 TO 19	49	28.3%	1,521	2,867	16,192	3.7	597	15,333	3.7	563	349	14
20 TO 29	19	11.0%	424	724	16,948	3.7	633	15,531	3.6	566	534	24
30 TO 39	12	6.9%	264	448	18,406	3.7	682	16,181	3.6	587	794	34
TOTAL OR AV. BY SIRE UNWEIGHTED	173		4,990	8,875	15,893	3.7	580	15,403	3.6	562	215	8
WEIGHTED BY NUMBER OF DAUGHTERS			4,990	8,875	15,903	3.7	581	15,399	3.6	562	222	9

TABLE 14.--Average production of milk and butterfat of daughters of sires in artificial breeding service with 49% or less Repeatability, grouped according to butterfat production range of the Predicted Difference--Continued

JERSEY

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
-30 TO -39	2	4.2%	28	32	6,717	5.0	337	8,533	5.1	439	-617	-34
-20 TO -29	1	2.1%	18	23	8,298	5.1	422	8,945	5.3	472	-291	-21
-10 TO -19	2	4.2%	31	35	8,372	5.5	457	9,761	5.1	494	-496	-10
- 1 TO - 9	9	18.8%	213	356	9,463	5.0	471	9,747	5.1	493	-43	-4
0 TO 9	15	31.3%	546	875	9,851	5.1	502	9,581	5.1	491	112	5
10 TO 19	9	18.8%	178	332	10,509	5.1	538	9,876	5.1	507	253	13
20 TO 29	6	12.5%	157	282	10,252	5.2	536	9,172	5.1	468	357	23
30 TO 39	2	4.2%	37	47	12,871	5.4	693	11,131	5.2	576	466	31
40 TO 49	2	4.2%	33	68	11,779	5.4	640	9,838	5.3	521	795	45
TOTAL OR AV. BY SIRE UNWEIGHTED	48		1,241	2,050	9,933	5.1	511	9,642	5.1	494	119	7
WEIGHTED BY NUMBER OF DAUGHTERS			1,241	2,050	9,973	5.1	513	9,657	5.1	495	131	7

BROWN SWISS

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
- 1 TO - 9	1	7.1%	10	16	14,162	3.7	524	13,540	4.0	545	227	-3
0 TO 9	6	42.9%	129	220	13,685	4.1	555	13,268	4.1	546	162	5
10 TO 19	5	35.7%	104	214	14,219	4.1	583	13,324	4.1	549	359	14
20 TO 29	1	7.1%	23	28	11,789	4.1	484	10,780	4.0	433	423	22
30 TO 39	1	7.1%	17	24	14,031	4.0	565	12,256	4.0	491	808	34
TOTAL OR AV. BY SIRE UNWEIGHTED	14		283	502	13,799	4.0	559	13,057	4.1	535	302	11
WEIGHTED BY NUMBER OF DAUGHTERS			283	502	13,841	4.0	560	13,086	4.1	536	306	11

M.SHORTHORN

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
- 1 TO - 9	1	14.3%	33	75	9,727	3.7	357	10,280	3.7	384	-130	-6
0 TO 9	4	57.1%	75	145	9,893	3.6	351	9,173	3.7	336	192	4
20 TO 29	2	28.6%	41	96	11,578	3.5	406	9,403	3.6	335	753	25
TOTAL OR AV. BY SIRE UNWEIGHTED	7		149	316	10,350	3.6	368	9,397	3.6	343	306	9
WEIGHTED BY NUMBER OF DAUGHTERS			149	316	10,357	3.6	368	9,393	3.6	343	310	9

RED DANE

PREDICTED DIFFERENCE BUTTERFAT RANGE POUNDS	SIRES NUMBER	PERCENTAGE OF SIRES IN GROUP	DAUGHTERS WITH HERD MATES NUMBER	RECORDS OF DAUGHTERS NUMBER	AVERAGE PRODUCTION DAUGHTERS MILK POUNDS	DAUGHTERS BUTTERFAT %	DAUGHTERS BUTTERFAT POUNDS	HERD MATES MILK POUNDS	HERD MATES BUTTERFAT %	HERD MATES BUTTERFAT POUNDS	PREDICTED DIFF. MILK POUNDS	PREDICTED DIFF. BUTTERFAT POUNDS
10 TO 19	1	100.0%	44	110	13,938	3.9	541	12,674	3.9	496	453	16
TOTAL OR AV. BY SIRE UNWEIGHTED	1		44	110	13,938	3.9	541	12,674	3.9	496	453	16
WEIGHTED BY NUMBER OF DAUGHTERS			44	110	13,938	3.9	541	12,674	3.9	496	453	16

AI BULL USAGE IN 1966 [1]

B. T. McDaniel and R. D. Plowman [2]

There have been many changes in the artificial insemination industry (AI) in the past 20 years. For instance, the number of cows bred per bull in AI studs has tripled. Technical advancements have made it possible for bulls to sire many more calves than was formerly true. Because of these improvements the differential usage of bulls has increased greatly. Progeny testing programs have developed and many bulls are sampled on a limited number of cows until a progeny test is available. With the development of frozen semen some bulls are used for many years after their death. Some bulls are mated to as many as 50,000 cows per year, although the average is only about 3,000. These factors have combined in such a manner that many feel that the effective number of bulls has decreased greatly although the actual number of bulls in studs has decreased only slightly from its peak in 1957 and 1958.

In an attempt to ascertain the effective use of bulls, the AI studs were asked to furnish information to USDA on the usage of individual bulls in 1966. Twenty-six of the 35 AI organizations were able to report either the number of first services or the number of ampules of semen shipped so that an estimate of number of first services could be obtained.

These 26 AI studs were responsible for about 67 percent of the services to dairy bulls in 1966. In this report bulls were also identified as to whether they were (a) in regular service, (b) in use only for progeny test, or (c) available only for special matings. Many of the bulls that were available only through special matings were dead and only a limited supply of semen was available.

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[1] The authors wish to express their appreciation to the 26 AI organizations furnishing the information used in this report.

[2] With the technical assistance of C. A. Rampendahl.

Many of the studs were able to report the actual number of first services, but some were able to report only the number of ampules used. A few reported some combination of number of first services and additional ampules sold. When only the number of ampules was reported, it was assumed that about two ampules of semen would used for each first service. Thus, the bulls involved were credited with half as many first services as there were ampules shipped. In cases where ampules used were reported for all bulls from a stud, the ratio of ampules to total first services in the stud was used to estimate first services by individual bulls.

The number of bulls (1,450) and number of first services (4,321,000) upon which this report is based are shown in table 15, stratified by breed and category of service. Data were not available on services to 562 bulls in 9 studs. Bulls in nonreporting studs serviced slightly over 2 million cows.

Of the 1,450 bulls in service, approximately 62 percent were in the regular category, 32 percent under progeny test, and 6 percent available only through special mating (table 15). The disparity between number of bulls and their effectiveness is shown by the 901 regular service bulls accounting for 92 percent of the inseminations. Slightly over 7 percent of the services resulted from the 470 bulls under progeny test, although they represented 32 percent of the bulls in service. The 79 bulls available through special mating were responsible for less than 1 percent of the services. The pattern appeared to be relatively similar for all the breeds except the Milking Shorthorns and Red Danes.

The average number of inseminations per bull by breed and category of service is shown in table 16. The 569 Holstein bulls in the regular class averaged nearly 6,000 services per bull, which is nearly three times that of any other group. Inseminations to regular bulls in the other major dairy breeds ranged from 1,356 to 2,180, or only about one quarter as many per bull as in the Holsteins. The number of matings per bull in the special group were all relatively small, and the Holsteins

TABLE 15.--Number and distribution of bulls and inseminations on which data were available for 1966

Breed	Bulls				Services			
	Regular	Special mating	Progeny test	All used	Regular	Special mating	Progeny test	All used
	------------------------------				Number ------------------------------			
Ayrshire-----	26	0	9	35	36,206	0	3,508	39,714
Guernsey-----	134	18	67	219	292,173	2,766	34,046	328,985
Holstein-----	569	42	323	934	3,401,634	26,820	240,309	3,668,763
Jersey-------	94	9	58	161	155,853	2,466	22,795	181,114
Brown Swiss--	58	6	13	77	78,627	1,127	7,710	87,464
M. Shorthorn-	16	4	0	20	14,305	414	0	14,719
Red Dane-----	4	0	0	4	241	0	0	241
Total-----	901	79	470	1,450	3,979,039	33,593	308,368	4,321,000

TABLE 16.--Average number of inseminations per bull by breed and type of service for data available in 1966

Breed	Service group			Overall
	Regular	Special mating	Progeny test	
	Number			
Ayrshire-------	1,393	0	390	1,135
Guernsey-------	2,180	154	508	1,502
Holstein-------	5,978	639	744	3,928
Jersey---------	1,658	274	393	1,125
Brown Swiss----	1,356	188	593	1,136
M. Shorthorn---	894	104	0	736
Red Dane-------	60	0	0	60

TABLE 17.--Percentage distributions of inseminations by breed and type of service for data available in 1966

Breed	Type of service			Total among breeds
	Regular	Special mating	Progeny test	
	Percent [1]			
Ayrshire-------	91.2	0	8.8	0.9
Guernsey-------	88.8	0.8	10.3	7.6
Holstein-------	92.7	.7	6.6	84.9
Jersey---------	86.1	1.4	12.6	4.2
Brown Swiss----	89.9	1.3	8.8	2.0
M. Shorthorn---	97.2	2.8	0	.3
Red Dane-------	100.0	0	0	[2]0

1/ Percentages within breeds.
2/ Less than 0.05 percent.

had many more than the other breeds. Breed differences in number of services were least pronounced in bulls under progeny test, where the inseminations ranged from 390 to 744 per bull. Overall, Holstein bulls averaged over twice as many services as the next highest group, the Guernseys. Ayrshire, Jersey, and Brown Swiss bulls all were lower than Guernseys. Services to Milking Shorthorn and Red Dane bulls were much fewer than the other breeds.

The percentage distributions of the services in each breed to bulls in the three types of services are shown in table 17. Of the five major dairy breeds, the Holsteins had the greatest percentage of inseminations by bulls in regular service. However, in the Milking Shorthorns and Red Danes, practically all of the services were to regular bulls. The relative use of special mating bulls was highest in the Milking Shorthorns, Brown Swiss, and Jerseys.

Jerseys devoted nearly twice as high a proportion of their services to progeny testing programs as the Holsteins, although it amounted to only about one service in eight for the Jerseys. The Ayrshires, Guernseys, and Brown Swiss were in between with somewhat similar percentages.

About 85 percent of the 4.3 million services covered in this study were to bulls of the Holstein breed. Guernseys were second with 7.6 percent, and Jerseys third with 4.2 percent. Brown Swiss bulls bred 2 percent of the total, and Ayrshires had slightly less than 1 percent. The percentages of cows bred to Milking Shorthorns and Red Danes were very low. Guernseys, Holsteins, and Jerseys accounted for nearly 97 percent of the services to dairy bulls.

In tables 18, 19, 20, and 21, bulls were grouped by breed according to how many services they had in 1966. Table 18 shows the distribution for regular service bulls, table 19 for special mating bulls, table 20 for bulls under progeny test, and table 21 is an overall grouping containing all bulls. The number of services for each of the groups is also shown.

Data on regular category bulls are presented in table 18 and figure 2. Twenty-one percent (120) of the Holstein bulls

TABLE 18.--The distribution of bulls in regular service by breed and number of inseminations for data available in 1966

Breed	Inseminations per bull grouped by interval				
	1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999	20,000 and over
	Number				
	Bulls in each class				
Ayrshire-----	13	12	1	0	0
Guernsey-----	64	54	12	4	0
Holstein-----	156	191	102	86	34
Jersey-------	52	34	7	1	0
Brown Swiss--	35	20	2	1	0
M. Shorthorn-	10	6	0	0	0
Red Dane-----	4	0	0	0	0
	Services to bulls in each class				
Ayrshire-----	3,890	24,074	8,242	0	0
Guernsey-----	25,938	138,442	79,639	48,154	0
Holstein-----	57,660	497,893	732,604	1,157,477	956,000
Jersey-------	18,817	81,601	45,253	10,182	0
Brown Swiss--	12,526	43,963	11,451	10,687	0
M. Shorthorn-	3,261	11,044	0	0	0
Red Dane-----	241	0	0	0	0

TABLE 19.--The distribution of bulls in service available only through special request by breed and number of inseminations for data available in 1966

Breed	Inseminations per bull grouped by interval		
	1 to 999	1,000 to 4,999	5,000 to 9,999
	Number		
	Bulls in each class		
Ayrshire---------	0	0	0
Guernsey---------	18	0	0
Holstein---------	36	5	1
Jersey-----------	9	0	0
Brown Swiss------	6	0	0
M. Shorthorn-----	4	0	0
Red Dane---------	0	0	0
	Services to bulls in each class		
Ayrshire---------	0	0	0
Guernsey---------	2,766	0	0
Holstein---------	6,488	13,075	7,257
Jersey-----------	2,466	0	0
Brown Swiss------	1,127	0	0
M. Shorthorn-----	414	0	0
Red Dane---------	0	0	0

TABLE 20.--The distribution of bulls in service only for progeny testing by breed and number of inseminations for data available in 1966

Breed	Inseminations per bull grouped by interval		
	1 to 999	1,000 to 4,999	5,000 to 9,999
	Number		
	Bulls in each class		
Ayrshire---------	9	0	0
Guernsey---------	57	10	0
Holstein---------	253	63	7
Jersey-----------	53	5	0
Brown Swiss------	11	2	0
M. Shorthorn-----	0	0	0
Red Dane---------	0	0	0
	Services to bulls in each class		
Ayrshire---------	3,508	0	0
Guernsey---------	14,164	19,882	0
Holstein---------	62,961	128,820	48,528
Jersey-----------	9,288	13,507	0
Brown Swiss------	4,953	2,757	0
M. Shorthorn-----	0	0	0
Red Dane---------	0	0	0

TABLE 21.--The distribution of bulls by breed and number of inseminations for data available in 1966

Breed	Inseminations per bull in all categories of service				
	1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999	20,000 and over
	Number				
	Bulls in each class				
Ayrshire-----	22	12	1	0	0
Guernsey-----	139	64	12	4	0
Holstein-----	445	259	110	86	34
Jersey-------	114	39	7	1	0
Brown Swiss--	52	22	2	1	0
M. Shorthorn-	14	6	0	0	0
Red Dane-----	4	0	0	0	0
	Services to bulls in each class				
Ayrshire-----	7,398	24,074	8,242	0	0
Guernsey-----	42,868	158,324	79,639	48,154	0
Holstein-----	127,109	639,788	788,389	1,157,477	956,000
Jersey-------	30,571	95,108	45,253	10,182	0
Brown Swiss--	18,606	46,720	11,451	10,687	0
M. Shorthorn-	3,675	11,044	0	0	0
Red Dane-----	241	0	0	0	0

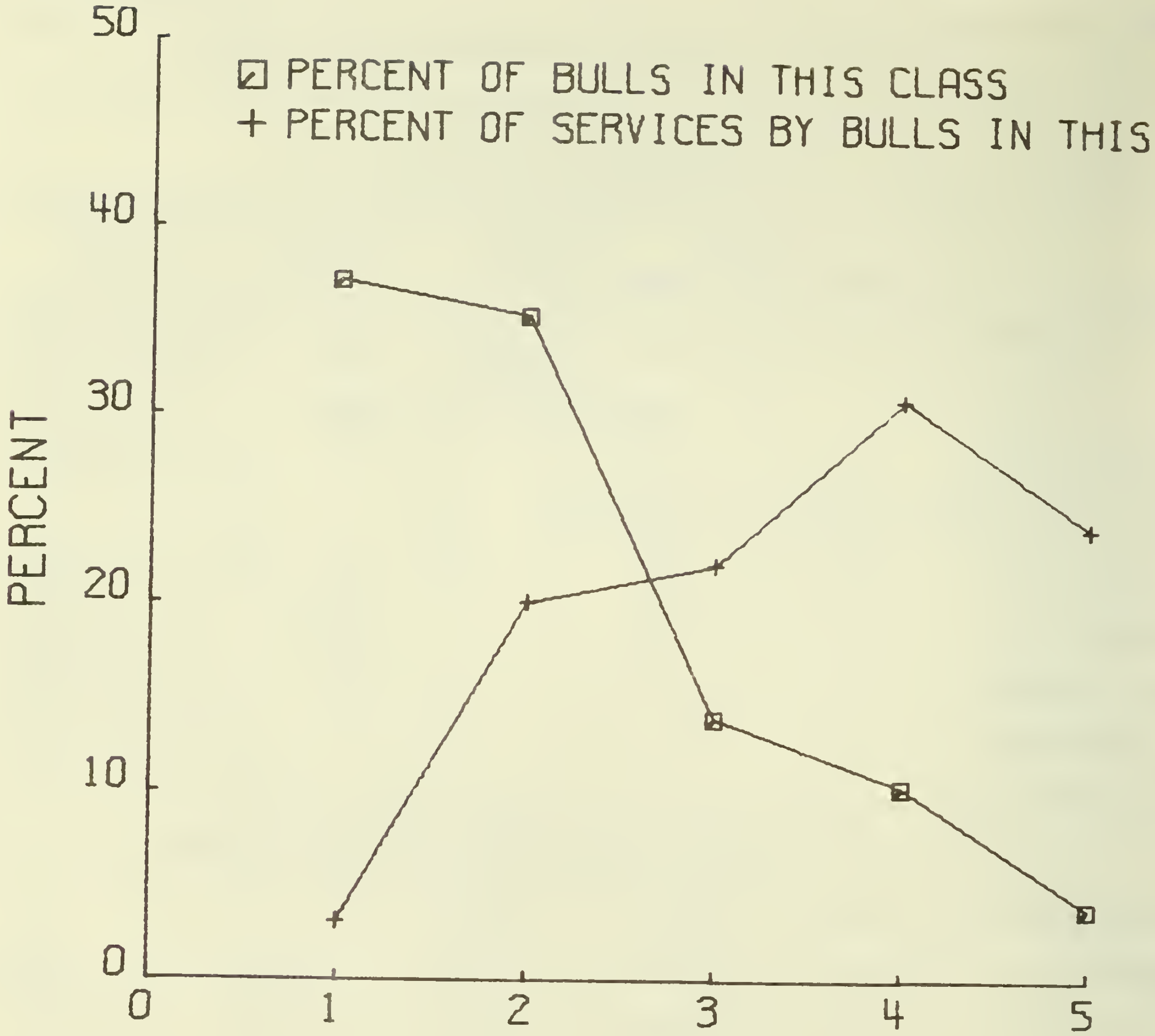

FIGURE 2.--The distribution of bulls in regular service by breed and number of inseminations for data available in 1966.

had over 10,000 services, including 6 percent (34) that had more than 20,000 inseminations. However, no bulls of the other breeds had as many as 20,000 services, and only six bulls in the other breeds had over 10,000. The large number of Holstein bulls (120) having over 10,000 first matings indicates that this amount is biologically feasible, and apparently easily reached. In fact, these 120 Holstein bulls accounted for five-eighths of the services in the Holstein breed or over one in every two inseminations in 1966. Table 18 also shows that the 37 percent of the regular bulls that had less than 1,000 first services each had little impact on the dairy cattle population as they accounted for only 3.1 percent of the breedings. Those having less than 10,000 but more than 1,000 matings accounted for the bulk of the remaining services.

Table 19 indicates that most of the bulls available through special mating had little impact as only six accounted for more than 1,000 inseminations.

Table 20 presents the stratifications for bulls under progeny testing programs. Most of the bulls under progeny testing programs (81.5 percent) had rather limited use (i.e., less than 1,000 services). Holstein bulls were used the heaviest. A question might be raised on whether or not bulls servicing 5,000 cows per year, as some of those so identified as progeny test, are really on a progeny testing program or whether they are simply in a young sire use program.

The overall summary of bulls by breed and category of service is shown in table 21. Figure 3 shows that 55 percent of the bulls in AI were responsible for less than 1,000 inseminations each. Although this group made up more than one-half of the bulls, they accounted for only 5 percent of the 4.3 million breedings used in this study. At the other extreme, the 34 bulls that had over 20,000 first services bred 22 percent of the cows, although they consisted of only 2.3 percent of the bulls. In a like manner, those 86 bulls having between 10,000 and 20,000 matings, although only 6 percent of the bulls in AI, accounted for 28 percent of the breedings. Thus, the contention of many that the effective number of inseminations per bull is considerably greater than the average is borne out. These data

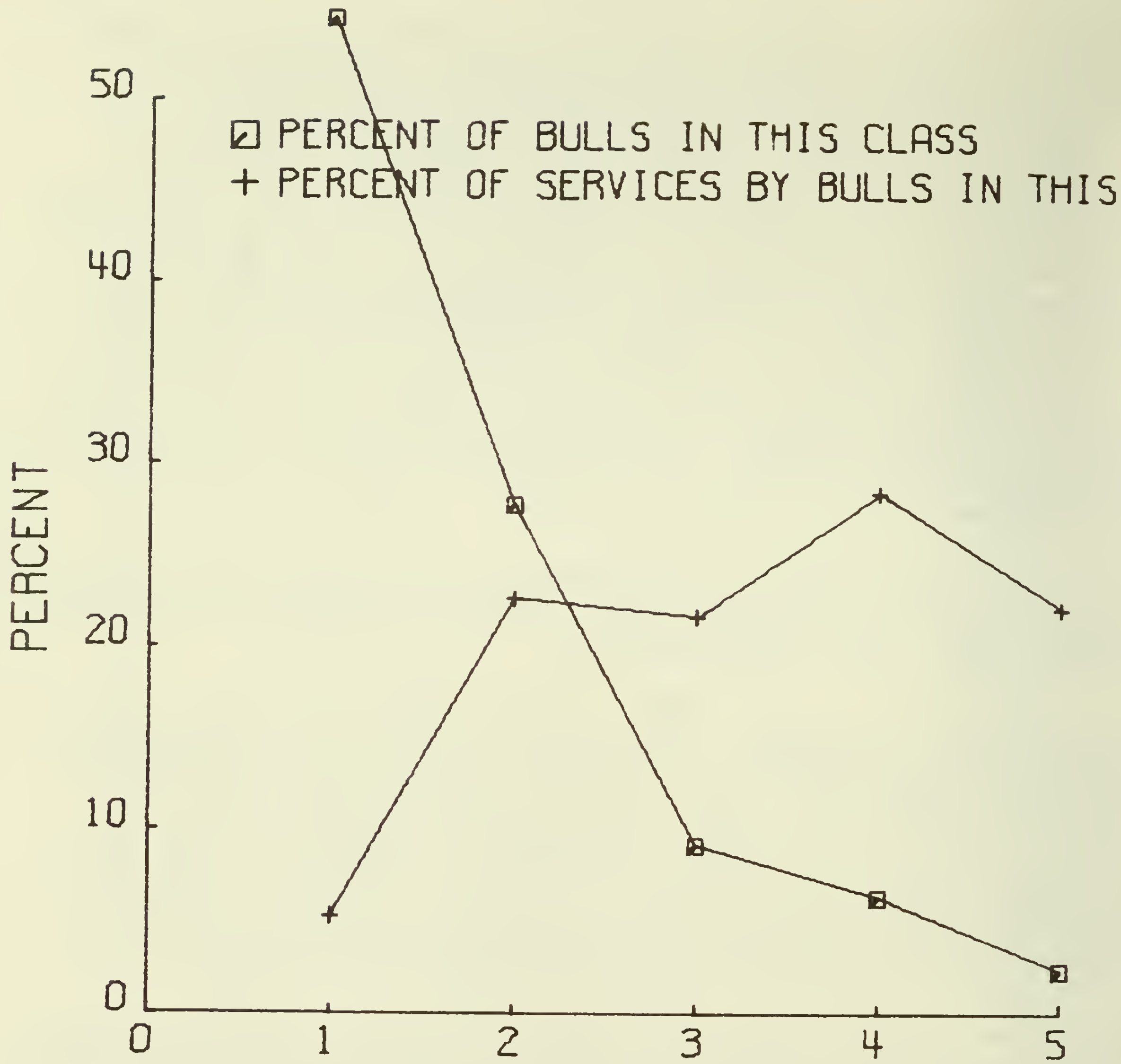

FIGURE 3.--The distribution of bulls by breed and number of inseminations for data available in 1966.

also show that the effective number of bulls in AI in the United States was probably less than half of the 2,010 dairy bulls in AI service in 1966, since there is such a disparity in their use.

The distributions of bulls in the various classes based on number of inseminations by breeds suggest that the latent semen-producing ability of bulls is not exploited very well in any breed except Holsteins. Even with this incomplete utilization, one bull accounted for over 20 percent of the services in the Ayrshire breed.

The distribution of number of inseminations shown in tables 18 and 21 suggests that many AI organizations should be able to reduce the number of bulls they have in regular service without endangering their ability to service their patrons. If this reduction were made, it should be possible to increase the genetic merit of the bulls in AI. It would appear that in most of the breeds other than Holsteins, the best bulls are not being exploited as widely as possible, assuming their semen-producing capacity on the average is as great as that of the Holsteins. This appears logical when one considers that only 28 bulls other than Holsteins had as many as 5,000 services in 1966.

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Idaho---- G. W. Cleveland, Dairy Science Dept., University of Idaho, P.O. Box 300, Boise 83701.
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September 1968

FACTORS INFLUENCING AVERAGE MILK PRODUCTION AND INCOME OVER FEED COST IN DHIA HERDS

by R. H. Miller and F. N. Dickinson

Milk production is the primary measure in all testing programs. In addition, testing programs in most States also include a wealth of information on an individual cow and on a herd basis. This includes such information as milkfat production, feed consumption, recommended concentrate feeding, days dry, pregnant, and in milk, cumulative milk and fat production for the lactation, value of product, income over feed cost, and various other economic values for judging cost and profitability. This information is calculated in the central processing labs from data obtained by the DHIA supervisors at the farm, in order to provide the dairyman with valuable information that he can use to assess the overall economic status of the dairy operation and to make intelligent management decisions. The primary end result of this entire program is to enable the dairyman to run a more efficient and profitable enterprise.

Comparatively little research has been conducted to judge the usefulness of the DHIA herd average estimates. Direct evaluation of the accuracy of the estimates is not possible using the testing information alone. However,

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indirect measures of the adequacy of the DHIA records can be made by studying relationships among the different factors.

Results are reported below of research that has been conducted to evaluate the worth of DHIA herd average data by examining the relation of milk production and estimated income over feed cost (IOF) to various types of herd average data. Primarily, the investigation centered on two questions: (1) How closely is herd average milk production related to estimated income over feed cost per cow? (2) How are other herd average feeding and management estimates related to milk production and IOF?

To study these questions, annual DHIA reports for Holstein herds covering the 1960-64 testing years were examined to locate herds with the following information: (1) value of product, (2) average concentrates (grain) fed per cow, (3) succulent forage (silage), (4) dry forage (hay), (5) pasture, (6) cost of concentrates, (7) total feed cost, and (8) percent days in milk during the year. A total of 8,048 annual herd averages from 23 States met these requirements. The number of herds by State is shown in table 1. The majority of the herds were from New York and Pennsylvania.

Table 2 contains the averages of all herds for the different factors studied, together with a measure of the relative amount of variation in each factor. Prices for concentrates (grain) and milk are included in table 2. Grain price was calculated by dividing the estimated cost of grain by the amount of grain reported fed. Similarly, the price of milk per hundredweight was obtained by dividing the reported value of product by the herd average milk production per cow.

These data represent conditions in DHIA herds 4 to 8 years ago. Since the period 1960-64, herd size, milk production, and grain feeding have all increased, while hay and pasture feeding have decreased.

TABLE 1.--Number of annual herd averages by State

State	No. of herd averages	State	No. of herd averages
Maine	60	Minnesota	307
New Hampshire	85	Iowa	331
Vermont	224	Missouri	50
Massachusetts	260	North Dakota	24
Rhode Island	8	Nebraska	32
Connecticut	188	Kansas	59
New York	1,978	Delaware	91
New Jersey	172	Maryland	310
Pennsylvania	2,961	Virginia	107
Ohio	38	West Virginia	136
Indiana	88	North Carolina	170
Illinois	369		
		Total	8,048

TABLE 2.--Averages and relative variation of factors studied in DHIA Holstein herds [1]

Factor	Average	Relative variation
		Percent
Herd size (cows)-------------	40.4	48
Milk (lb.)-------------------	12,011	13
Fat (pct.)-------------------	3.70	5
Fat (lb.)--------------------	445	14
Days in milk (pct.)----------	84.7	4
Concentrates (100 lb.)-------	39.1	23
Succulent forage (100 lb.)---	95.5	46
Dry forage (100 lb.)---------	42.7	32
Pasture (days)---------------	161.8	25
Value of product (dollars)---	555.92	19
Milk price/cwt. (dollars)----	4.63	14
Cost of concentrates (dollars)	118.07	31
Feed cost (dollars)----------	237.04	24
Feed cost/cwt.milk (dollars)-	1.98	22
Income over feed cost(dollars)	318.88	25
Grain price/cwt. (dollars)---	3.02	19

[1] Averages are on a herd average per cow per year basis.

The measure of relative variation of each factor reflects two different sources of variation. One source is the inherent herd differences that occur in real life. A second source comes from errors made in estimating these factors at the farm. For instance, fat percent, percent days in milk, milk production, and milk price all exhibit relatively low variation and are probably all measured with a relatively high degree of accuracy. On the other hand, the greatest amount of variation occurs in estimates of silage and hay fed, with concentrates and pasture showing somewhat less variation. Although a high degree of herd differences is involved in these estimates, the variation is undoubtedly due in part to errors made in estimating consumption. On most farms the amount of hay and silage fed is difficult to assess and is usually reported from figures provided to the DHIA supervisor by the dairyman. Commonly, the dairyman gauges the number of feet of silage fed from a silo or the number of bales of hay fed to the herd in a given period of time. These estimates must then be averaged over the total number of cows consuming the feed. Generally, it is not practical for the DHIA supervisor to obtain an independent estimate. Since most cows are normally fed at least part of their concentrates individually at the time of milking, it is possible to obtain a more accurate estimate of concentrate feeding level. The number of days on pasture likewise can be determined with a greater degree of accuracy than amounts of hay and silage. However, the determination of the energy content of pasture is more difficult than for the other feed components. For these reasons, the reporting of feed consumption is unofficial or Owner-Sampler in nature.

PREDICTING MILK PRODUCTION

The first phase of the study was directed toward evaluating the usefulness of feeding and management factors in predicting the annual herd average milk yield. The higher the influence that these feed and management factors have on production, or cost of production, the greater the benefit to the dairyman from having this information.

The analysis was based on comparisons of herds in the same county tested in the same year. By studying the data in this manner, most of the errors associated with consistent overestimation or underestimation by a single DHIA supervisor are removed. Herds in the same county and testing year would usually be tested by the same supervisor. In addition, State and regional biases are circumvented by this procedure.

The factors studied were concentrates fed, silage fed, hay fed, days on pasture, percent days in milk, and herd size. Herd size was considered simultaneously in order to adjust the other factors for any differences that may have existed between large herds and small herds.

The results of two separate analyses are given in table 3. In the first analysis, (table 3, analysis one) all the factors listed above were evaluated for their effects on production. The effect of each factor is stated as the number of pounds of annual herd average milk yield change for each increase and one unit in the factor. Grain, silage, and hay are expressed in 100-pound units, pasture is in days, days in milk is a percentage, and herd size is in one-cow units. Table 3 indicates that all factors except herd size had a positive effect on milk yield. For example, there was an average increase of 98.3 pounds of milk for each 100-pound increase in the amount of grain fed per cow. On the other hand, there was a decrease of 1.1 pounds of milk per cow for each additional cow in the herd. To judge the usefulness of herd size in predicting milk production, the same analysis was carried out, leaving out herd size. These results are also shown in table 3 under analysis two. The accuracy of predicting milk yield with all six variables was 42.1 percent while the accuracy decreased only to 42.0 percent when herd size was omitted. Thus, herd size was of little or no value

TABLE 3.--Effects of various factors on herd average milk production [1]

Factor	Pounds change in milk per unit change in factor, holding other factors the same	
	Analysis I	Analysis II
Grain (100 lb.)	+98.3	+98.2
Silage (100 lb.)	+8.8	+8.8
Hay (100 lb.)	+17.2	+17.2
Pasture (days)	+5.0	+5.0
Percent days in milk (1 percent)	+115.6	+115.8
Herd size (cows)	-1.1	-----

[1] Milk is expressed in units of annual herd average yield per cow (pounds).

TABLE 4.--Effects of estimated feeding levels on milk production

Feed component	Pounds change in milk per unit change in factor, holding the other feed amounts the same	Relative importance [1]
Grain (100 lb.)	+105.0	27.7
Silage (100 lb.)	+9.4	3.4
Hay (100 lb.)	+18.8	1.5
Pasture (days)	+5.4	1.0

[1] Relative importance expressed in terms of relative amount of variation in milk production explained by the factor, as a ratio to the amount explained by days on pasture.

in estimating production in this situation. It should be kept in mind that herd size differences, which are expressed through differences in amounts of feed or percent days in milk, are still reflected in the results in the second analysis. As can be seen in table 3, the effects of the remaining factors were changed very little when herd size was ignored.

As indicated in table 3, percent days in milk has a strong relationship to milk yield. There is an increase of about 116 pounds in the herd average milk production for each 1 percent increase in percent days in milk. Since there may well be increased feeding levels in herds with above average days in milk, the effects of percent days in milk may be associated with those of the various feeding factors. In order to evaluate the full impact of the feeding factors, a third analysis was conducted, the results of which are shown in table 4.

The effects of the various factors shown in table 4 are only slightly different from those in table 3. The effects of the four feeding components are greater when percent days in milk is ignored, indicating that herds with cows in milk a greater proportion of the time also have more successful feeding programs. However, ignoring percent days in milk decreases the accuracy of predicting milk production to only 35.7 percent. This indicates that percent days in milk has other effects on yield in addition to reflecting a higher level of feeding. For instance, percent days in milk appears to be extremely important in reflecting the success of a dairyman's breeding program for settling cows within a reasonable time after calving and for maintaining good herd reproductive health. Percent days in milk probably also reflects the inherent persistency of the cows as well as the dairyman's ability to keep cows in milk for normal full length lactations.

Table 4 also provides a measure of the relative importance of the four feeding estimates to herd average milk production. There are many ways in which the importance of these factors could be compared. The method of comparison chosen was to evaluate the feed components on the basis of the amount of the variation in milk production explained by each. Days on pasture was used as the standard of comparison, since it was the least important factor. For example, table 4 indicates that concentrates was most useful in predicting milk yield, being 27.7 times as important as pasture. Silage was 3.4 times as useful as pasture, while hay was only 1.5 times more valuable than pasture. These evaluations should not be confused with the energy contributions of the various factors to the total ration fed.

As a further illustration of the relationships of the feed estimates to herd average milk production, the effects listed in table 4 are shown graphically in figures 1-4. These graphs should be interpreted as the average effects of the feeding factors over the entire range of herd conditions represented in the data. There may be considerable variation in the physical nature and energy value of the feeds from one herd to another, particularly in the case of forages. Forages differ widely in moisture content, stage of maturity at harvesting, palatability, and in their crop origin. These variations lead to great fluctuations from herd-to-herd in the energy value of the forages for feeding purposes. These differences may partially account for the difficulty in relating estimated forage consumption to changes in milk yield. If both the amounts and energy value of forages were accurately assessed, forage consumption would undoubtedly show a closer relationship to milk production. Also, the relationships would be expected to change from one set of feeding conditions to another. However, it was not possible to distinguish different feeding systems in the data reported through DHIA.

Table 4 and figures 1-4 clearly indicate that the reported amount of concentrates is most closely related to herd average milk production. In general, the responses to each of the components (concentrates, hay, silage, and

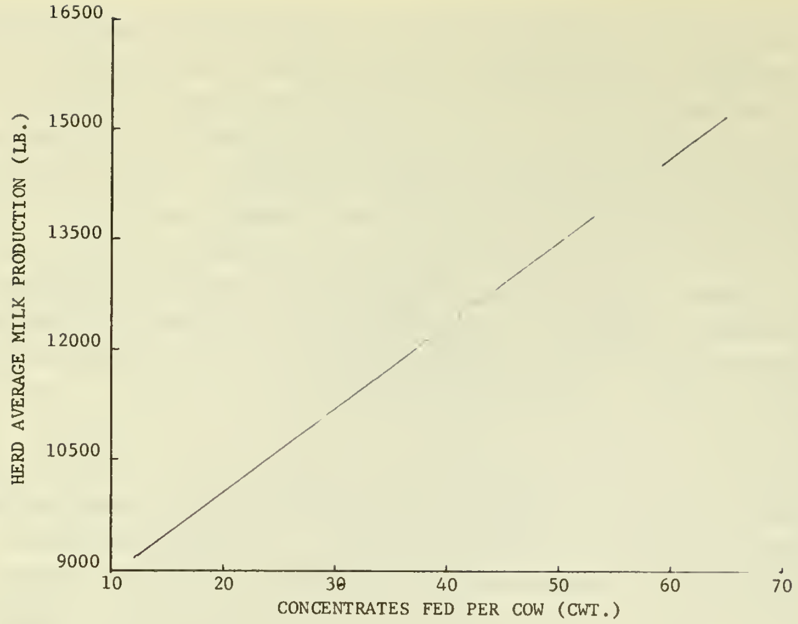

Figure 1.--Relationship between herd average milk production and concentrate feeding levels, holding forage intake constant.

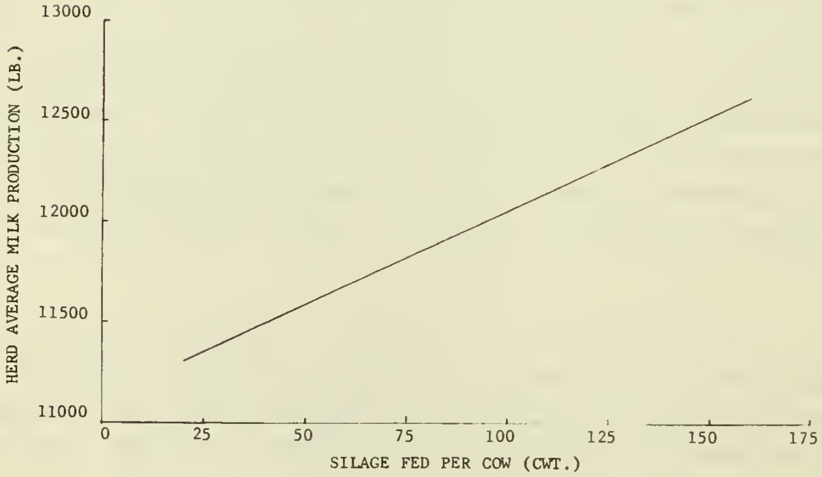

Figure 2.--Relationship between herd average milk production and silage feeding levels, holding grain and other forage intake constant.

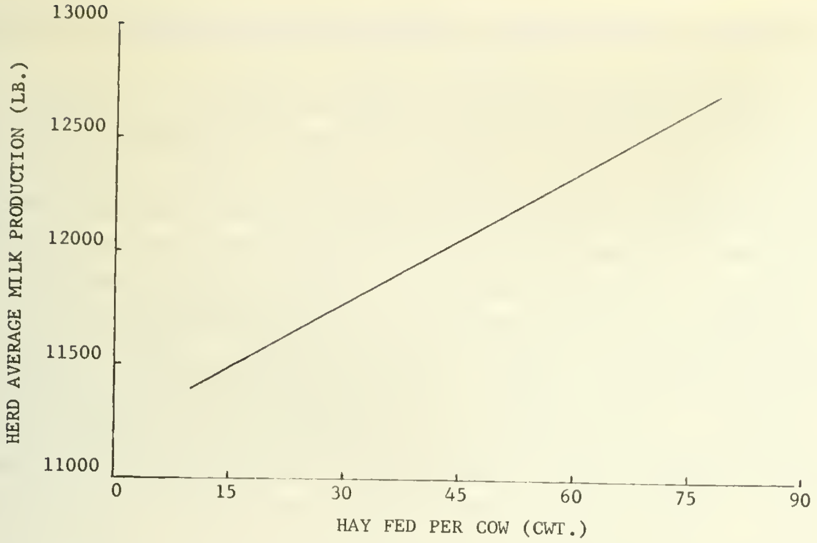

Figure 3.--Relationship between herd average milk production and hay feeding levels, holding grain and other forage intake constant.

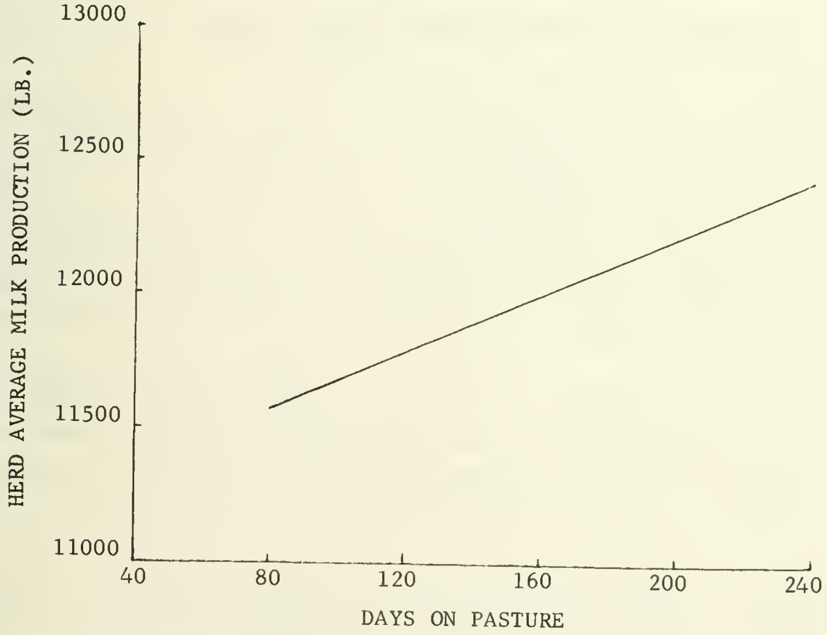

Figure 4.--Relationship between herd average milk production and days on pasture, holding grain and other forage intake constant.

pasture) are somewhat less than might have been anticipated.

The practical implication of this result is that the use of grain in the feeding program is a very important factor in the producing level of the herd. This is a widely recognized fact and has been reflected in the trend toward more liberal use of concentrates in dairy rations over the past several years. In the last ten years there has been a 50 percent increase in the amount of grain fed per cow in DHIA. Successful dairymen now recognize the profitability of feeding high levels of grain to inherently high producing cows. This result, emphasizes the benefits that dairymen can gain from following the principles of lead feeding and challenge feeding that have been widely advocated in recent years. Research and practical experience have indicated that extra concentrates fed in lead feeding and challenge feeding programs will result in the greatest return per dollar invested. The use of grain will necessarily also be affected by the quality and quantity of home-grown forages used.

PREDICTING INCOME OVER FEED COST

The second portion of the study deals with using DHIA estimates to predict the herd average income over feed cost per cow (IOF). Price variables were considered, in addition to the factors previously mentioned. The following factors were evaluated to estimate their influence on IOF: milk, milk price, grain, percent days in milk, silage, hay, pasture, fat percent, and herd size. The results are shown in table 5.

The results in table 5 show the amount of change in IOF for each unit increase in the various factors. As an example, for each 1-dollar increase in the price of milk, there is an increase of $118.14 in IOF.

These results require careful interpretation. The effects of each factor are measured by observing the change

TABLE 5.--Effects of various factors on herd average income over feed cost per cow

Factor	Dollar change in income over feed[1] cost per unit change in factor
Milk (100 lb.)	+4.30
Milk price (dollars)	+118.14
Grain price (dollars)	-38.52
Grain (100 lb.)	-2.73
Days in milk (1 percent)	+.086
Silage (100 lb.)	-.36
Hay (100 lb.)	-1.07
Pasture (days)	-.085
Fat percent (1 percent)	-3.22
Herd size (cows)	-.015

[1] Footnote table 6.

TABLE 6.--Effects of various factors on income over feed cost when milk production is ignored

Factor	Dollar change in income over feed[1] cost per unit change in factor
Milk price (dollars)	+120.33
Grain price (dollars)	-23.88
Concentrates (100 lb.)	+1.47
Days in milk (1 percent)	+5.06
Silage (100 lb.)	+.012
Hay (100 lb.)	-.35
Pasture (days)	+.13
Fat percent (1 percent)	+3.96
Herd size (cows)	-.06

[1] Effect of the factor when all other factors remain the same.

in IOF when all other factors remain the same. Thus, for example, when all other variables are held constant, there is a decrease of $2.73 in IOF for each 100-pound increase in the amount of concentrates fed. The reasonableness of this result can be seen by remembering that this effect is obtained by holding all other factors, including milk and milk price, constant. For example, if the cows in a herd are fed more grain, but production fails to increase, a decrease in IOF will result because of the increased costs. Since milk price is also held constant, there is no way in which income can rise. In the same manner, all the feeding elements show a negative effect. Also, an increase of $1 in grain price per hundredweight reduces IOF by $38.52 per cow per year because feed cost is increased while the value of product remains constant.

The factors shown in table 5 give an accuracy of 94.4 percent in the prediction of IOF. Of these variables, percent days in milk, fat percent, and herd size were of no additional value in the prediction.

Milk and milk price were the two next most useful factors for prediction purposes. The effects of the other variables are greatly altered by the inclusion of milk production in the analysis. For example, the effects of the feeding estimates would be exerted almost entirely through their impact upon herd average milk yield. Thus, the results in table 5 are somewhat artificial. For this reason, an additional analysis was carried out excluding milk production, in order to evaluate the total impact of the feed components on IOF. These results are given in table 6.

When milk production is allowed to vary, the results for the feeding factors are entirely different. Grain, silage, and pasture have positive effects, while hay still has a small negative effect on income over feed cost. The negative contribution of hay appears to indicate that the amount dairymen charged for the cost of the hay exceeded the additional income brought about by increased hay feeding. As seen in table 4, increases in the estimated hay fed did result in higher milk yield.

The factors in table 6 give an accuracy of 46.7 percent in the prediction of IOF. Of the nine variables, herd size, fat percent, and silage were found to be of little use in improving the accuracy of prediction. While silage had a positive relation to IOF, the added returns per unit fed were so small as to be inconsequential.

The most important factors, in order of importance, were: milk price, percent days in milk, concentrates, grain price, pasture, and hay.

SUMMARY

The results of this study and their implications can be summarized as follows: (1) There is a strong relationship between milk yield and income over feed cost, so that production level is an accurate indication of the economic success of the dairy enterprise, excluding the question of the efficiency of the use of capital and labor. (2) Estimated concentrate feeding is the most important feeding criterion measured in DHIA, and is strongly associated with herd average milk production and IOF. The results indicate that the proper use of liberal concentrate feeding, particularly to high-producing cows, is a key attribute of successful dairy management. (3) The proportion of the year that cows are in milk is an important management attribute. This factor reflects (a) the inherent producing ability of the herd, (b) feeding and labor management characteristics in the herd, and (c) the level of reproductive efficiency in the herd. (4) DHIA forage estimates (hay, silage, pasture) are of little value in predicting income over feed cost and milk production of a herd, perhaps due to the wide variations in energy content of forage. (5) DHIA forage estimation procedures need to be sharpened in order to make these estimates more useful than they are at present. This may be achieved by wider use of forage testing and by training programs designed to assist dairymen and DHIA supervisors in estimating forage quantities actually consumed.

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ERRATA: For May 1968 Dairy Herd Improvement Letter, ARS-44-204, Artificial Insemination (AI) Participation Report for the United States 1967. Line 1, page 1, should read as follows: A total of 7,847,607 cows were bred artificially in the United States in 1967.

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AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

Dairy-Herd-Improvement Letter
ARS-44-206
(Vol. 44, No. 5)

November 1968

IDENTIFICATION OF SIRES IN OFFICIAL DAIRY HERD IMPROVEMENT HERDS

by B. T. McDaniel, F. N. Dickinson, and C. A. Rampendahl

The percentage of lactations completed by dairy cows in
he United States each year that is usable by USDA for esti-
nating the genetic transmitting ability of bulls, is dependent
n three factors: (1) The proportion of cows on Official DHI;
2) the proportion of lactation records that are reported to
SDA (primarily a function of whether or not a cow's data are
rocessed through one of the dairy record processing labora-
ories); and (3) the proportion of Official DHI lactation re-
ords that are reported to USDA with sire identification. The
tatus of factors (1) and (2) is given annually in the DHI
etter containing the DHIA Participation Report. The status
f factor (3) is described herein by States for the 12-month
eriod, September 1, 1967, through August 31, 1968.

As shown in table 1, the proportion of Official DHI
actation records that is reported to USDA with sire identi-
ication, and therefore is useful in genetic evaluations, has
ctually decreased in the past 3 years. The cause of this
ecrease is not clear. It may have resulted from a true pro-
ortionate decrease in the reporting of sire identification.
owever, it may also have been due partially to the increase
hat has occurred during this period in the proportion of DHI
actation records that are reported to USDA.

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TABLE 1.--Official DHI records without sire identification reported to USDA

Year[1]	Lactations reported without sire identification	Lactations reported without sire identification, as percentage of all records reported	Cows for which data are on computer processing [2]
	Number	Percent	Percent
1968 [3] ------	813,945	41.0	85
1966 --------	665,354	40.7	83
1965 --------	563,938	37.8	75
1964 --------	495,279	37.1	65

[1] Data for January 1, 1967, to August 31, 1967, were not available.

[2] Percentage of all Official DHI cows that were reported as on test and for which data are being processed through regional computing centers.

[3] September 1, 1967, through August 31, 1968. January 1-December 31 for other years.

The data in table 1 indicate that during the past 5 years over 3 million lactation records have been reported to USDA without sire identification. Unfortunately, these records were costly to handle and contributed little to sire and cow evaluations.

During the 12-month period ending August 31, 1968, approximately 2 million Official DHI lactation records were reported to USDA. Of these, 813,945, or 41 percent, did not have sire identification. Since records without sire identification are not useful in USDA-DHIA genetic appraisals, only 59 percent of the lactation records reported to USDA could be used in sire and cow evaluations.

About 10 percent of the lactation records that were reported with sire identification were found to contain incorrect or conflicting information by USDA editing procedures and,therefore, could not be used. These unusable records, plus those without sire identification, resulted in a loss of approximately 920,000 lactation records in this 12-month period. These records could have been used for genetic appraisals and for obtaining other information of value to the dairy industry if accurate sire identification had been reported.

The data in table 2 show, by States, the number of records that were reported by USDA without sire identification in 1968 and the overall loss of valuable information that resulted from this missing identification. The number of records without sire identification is shown for each State in the third column as a percentage of all Official DHI records reported from that State. Also shown in table 2 is the percentage of dairy cows in each State that were actually useful in USDA-DHIA sire evaluations. Of the 50 States, Wyoming had the highest percentage of lactations reported with valid sire identification (83.6). Hawaii had the lowest percentage (3.3). Thus, the range among States in the proportion of Official DHI records that were sent to USDA without sire identification was from a low of 16.4 percent to a high of 96.7 percent. Five States each reported at least 50,000 lactations without sire identification. On a national basis, only 7.9 percent of all the milk cows in the country were eligible for use in sire evaluations.

The last column in table 2 shows the percentage of the cows in each State that would be useful in sire evaluations if all Official DHI lactation records were processed through regional computing centers. The figures at the bottom of the last two columns in table 2 indicate that if lactation records for all Official DHI cows were on computer processing, the proportion of cows eligible for sire evaluations would increase from the 7.9 percent to 9.3 percent. If all cows in the fficial DHI program were on computer processing and if valid ire identification were reported, then the percentage of milk ows that would contribute to sire evaluations in the United tates would double (15.8). These data clearly indicate that tremendous amount of valuable information could be obtained or the dairy industry by increasing the proportion of Official HI lactation records that are reported to USDA with proper ire identification. The percentage of cows that actually contributes information to sire evaluations in the various States ranges from a low of 0.9 (Hawaii) to a high of 23.1 (Connecticut). t present, Official DHI lactation records from all States xcept California are scheduled to be 100-percent computer processed within the next year.

TABLE 2.--Sire identification in Official DHI herds and its effect on sire evaluation

State	Official DHI lactations without sire identification		Official DHI records with valid sire identification	Cows on Official DHI recordkeeping[1]	Official DHI cows on machine processing[2]	Cows useful in sire evaluation[3]	Potential cows useful in sire evaluation if all were on machine processing
	Reported in 1968	Percent of all records reported					
	Number	Percent	Percent	Percent	Percent	Percent	Percent
Ala-----	19,591	68.5	31.5	21.4	100.0	6.7	6.7
Alaska--	46	27.2	72.8	10.3	100.0	7.5	7.5
Ariz----	4,051	32.3	67.7	28.0	56.6	10.8	19.0
Ark-----	1,515	40.1	59.9	4.1	100.0	2.5	2.5
Calif---	66,640	45.9	54.1	47.5	20.7	5.3	25.7
Colo----	7,488	46.8	53.2	19.7	100.0	10.5	10.5
Conn----	8,507	29.8	70.2	32.9	100.0	23.1	23.1
Del-----	1,965	37.8	62.2	26.5	100.0	16.5	16.5
Fla-----	8,319	44.2	55.8	11.6	100.0	6.5	6.5
Ga------	20,173	60.9	39.1	21.6	100.0	8.4	8.4
Hawaii--	3,781	96.7	3.3	30.0	93.4	0.9	1.0
Idaho---	14,933	61.9	38.1	14.4	93.8	5.2	5.5
Ill-----	18,590	35.3	64.7	16.2	100.0	10.5	10.5
Ind-----	15,901	48.1	51.9	16.2	100.0	8.4	8.4
Iowa----	28,065	47.0	53.0	9.8	100.0	5.2	5.2
Kans----	13,951	38.1	61.9	17.3	100.0	10.7	10.7
Ky------	10,431	48.4	51.6	6.2	100.0	3.2	3.2
La------	2,696	38.4	61.6	4.4	93.1	2.5	2.7
Maine---	6,759	29.4	70.6	26.1	100.0	18.4	18.4
Md------	15,599	40.8	59.2	24.0	100.0	14.2	14.2
Mass----	6,352	24.8	75.2	27.1	100.0	20.4	20.4
Mich----	38,564	41.9	58.1	15.8	100.0	9.2	9.2
Minn----	58,234	49.3	50.7	10.9	98.2	5.4	5.5
Miss----	11,156	61.1	38.9	9.9	100.0	3.9	3.9
Mo------	12,403	50.6	49.4	6.6	100.0	3.3	3.3
Mont----	751	17.0	83.0	8.8	88.8	6.5	7.3
Nebr----	9,593	57.2	42.8	8.4	99.6	3.6	3.6
Nev-----	1,633	48.7	51.3	47.3	64.2	15.6	24.3
N. H----	4,278	27.6	72.4	31.0	100.0	22.4	22.4
N. J----	10,635	34.1	65.9	27.9	100.0	18.4	18.4
N. Mex--	3,196	27.1	72.9	18.2	100.0	13.3	13.3
N. Y----	74,896	32.5	67.5	17.4	100.0	11.7	11.7
N. C----	21,985	46.6	53.4	25.0	100.0	13.4	13.4
N. Dak--	2,336	46.6	53.4	3.4	92.7	1.7	1.8
Ohio----	26,081	38.6	61.4	18.3	100.0	11.2	11.2
Okla----	8,658	56.3	43.7	10.7	100.0	4.7	4.7
Oreg----	12,056	50.7	49.3	20.7	87.6	8.9	10.2
Pa------	50,280	22.7	77.3	24.0	100.0	18.6	18.6
R. I----	733	28.5	71.5	25.3	100.0	18.1	18.1
S. C----	12,377	52.4	47.6	35.2	100.0	16.8	16.8
S. Dak--	2,361	39.6	60.4	2.7	100.0	1.6	1.6
Tenn----	16,120	55.8	44.2	8.9	100.0	3.9	3.9
Tex-----	16,983	58.6	41.4	8.5	99.4	3.5	3.5
Utah----	19,004	51.5	48.5	27.8	100.0	13.5	13.5
Vt------	19,356	41.2	58.8	18.1	100.0	10.6	10.6
Va------	26,678	45.1	54.9	26.1	100.0	14.3	14.3
Wash----	20,098	48.9	51.1	19.1	100.0	9.8	9.8
W. Va---	4,232	40.3	59.7	11.5	100.0	6.9	6.9
Wis-----	53,838	39.0	61.0	6.8	100.0	4.1	4.1
Wyo-----	77	16.4	83.6	7.7	100.0	6.4	6.4
U.S-----	813,945	41.0	59.0	15.8	85.4	7.9	9.3

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[1] See table 2, March 1968 Dairy-Herd-Improvement Letter for source of data.

[2] See table 5, March 1968 Dairy-Herd-Improvement Letter for source of data.

[3] To be useful in sire evaluation, cows must be (1) on Official DHI test, (2) on computer processing, and (3) have valid sire identification.

Variation among the 50 States in percentage of Official DHI cows with sire identification is summarized in table 3. This table indicates that only two States (Montana and Wyoming) reported sire identification on over 80 percent of their Official DHI cows. Only 10 States reported sire identification on over 70 percent of their cows. However, 37 States reported sire identification on over half of their cows correctly.

The 12 States that reported over two-thirds of their Official DHI cows properly identified by sire are listed in table 4. The majority of these States are either in the Rocky Mountain area or in the Northeast.

The variation in percentage of milk cows used in USDA-DHIA sire evaluations is summarized in table 5. This table shows that in only two States (Connecticut and New Hampshire) are over 21 percent of the cows being used. In 10 States 15 percent or more of the cows are being used, but at the other extreme less than 5 percent of the cows are being used.

The 10 States in which 15 percent or more of the milk cows are being used in USDA-DHIA sire summaries are listed in table 6. The high proportion of cows used from these States reflects a combination of a high percentage of cows on test, a high percentage of cows correctly identified by sire, and most if not all of the cows on Official DHI testing being processed through regional computing centers and reported to USDA. The majority of these 10 States are in the Northeast.

The continuing failure to report sire identification on over 40 percent of the Official DHI cows indicates that a great deal of improvement is necessary. Perhaps new directions such as systems that capture sire identification of female calves when they are born in Official DHI herds would help to increase the number of cows that are properly identified. At present several of the regional computing centers are working on the development of such systems.

The two groups that are most involved with and affected by lack of identification of sires are the dairy breed registry associations and the artificial insemination (AI) organizations. The proportion of correctly identified cows could be increased materially if there were some method to positively identify all daughters of bulls used in AI. It would seem to be in the best interest of the AI organizations to contribute the greatest amount of time and effort to increase the proportion of correctly identified cows on Official DHI test in their areas. It would also seem to be in the best interest of the dairy breed registry associations to obtain as much production information as possible on the cows in their breed. Such information would materially increase the value of the services that the breed associations could provide to the industry.

TABLE 3.--Variation in percentage of Official DHI cows with sire identification among States

Cows with sire identification	States	Cows with sire identification	States
Percent	Number	Percent	Number
90 or more	0	40-49	8
80-89	2	30-39	4
70-79	8	20-29	0
60-69	10	10-19	0
50-59	17	1-9	1
U.S. average	59		

TABLE 4.--States with over two-thirds of their Official DHI cows identified by sire

State	Cows identified by sire	State	Cows identified by sire
	Percent		Percent
Wyoming	83.6	New Hampshire	72.4
Montana	83.0	Rhode Island	71.5
Pennsylvania	77.3	Maine	70.6
Massachusetts	75.2	Connecticut	70.2
New Mexico	72.9	Arizona	67.7
Alaska	72.8	New York	67.5
U.S. average			59.0

TABLE 5.--Variation in percentage of milk cows used in USDA-DHIA sire evaluations

Cows used in sire evaluations	States	Cows used in sire evaluations	States
Percent	Number	Percent	Number
21 or more	2	7	1
18-20	5	6	5
15-17	3	5	4
12-14	5	4	2
10-11	7	3	6
9	2	2	2
8	3	1	3

TABLE 6.--States in which 15 percent or more of their milk cows are used in USDA-DHIA sire summaries

State	Sires identified	State	Sires identified
	Percent		Percent
Connecticut	23.1	Maine	18.4
New Hampshire	22.4	Rhode Island	18.1
Massachusetts	20.4	South Carolina	16.8
Pennsylvania	18.6	Delaware	16.5
New Jersey	18.4	Nevada	15.6
U.S. average			7.9

ERRATA

Recently the National Association of Animal Breeders found that 71,696 artificial inseminations to beef cows in 1965, 1966, and 1967 were not reported. These were inseminations made by the Armour and Company Beef Cattle Inprovement Research, 1/ between November 1, 1965, and November 1, 1967. The corrected total AI services of beef sires bred to beef cows in the United States in 1966 and 1967 are shown in the following table.

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TABLE 7.--Corrected data for beef cattle artificially inseminated in 1966 and 1967

Year	Previously reported services	New data 2/	Corrected U.S. total	Corrected percentage of AI beef cows
	Number	Number	Number	Percent
1966-----	647,143 3/	48,038	695,181	2.0
1967-----	649,161 4/	23,658	672,819	1.9

1/ P. O. Box 9222, Chicago, Ill. 60690.

2/ Data received from H. A. Herman, Executive Secretary, National Association of Animal Breeders, P. O. Box 1033, Columbia, Mo. 65201, in letter of July 8, 1968.

3/ See April 1967 Dairy-Herd-Improvement Letter, ARS-44-191. Tables 1, 3, 4, and 5 are affected by the new data.

4/ See May 1968 Dairy-Herd- Improvement Letter, ARS-44-204. Tables 1, 3, 4, and 5 are affected by the new data.

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Dairy-Herd-Improvement Letter
ARS-44-207
(Vol. 44, No. 6)

December 1968

THE PROBABILITY FOR DETERMINING WHICH OF TWO BULLS HAS A SUPERIOR GENETIC MERIT

by B. T. McDaniel, F. R. Allaire 1/, and F. N. Dickinson

Dickinson 2/ has shown that daughters of bulls with high plus Predicted Differences (PD) for milk yield return more dollars of income over feed cost than progeny of bulls with lower and minus PD's. This means higher production and more profits for dairymen milking daughters of bulls with high PD's. Also, McDaniel 3/ has shown that daughters of high PD bulls eat more forage and are better feed converters. Since PD is really the best estimate of a bull's genetic transmitting ability for production, dairymen can increase their production and profits by using genetically superior bulls chosen on PD.

Bulls, of course, differ considerably in their level of true genetic transmitting ability. Also, the estimate of

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1/ Dairy Department, The Ohio State University, Columbus.
2/ Dickinson, Frank. Daughters of high "PD" sires can add $1,600 income to a 50-cow herd. Hoard's Dairyman. September 10, 1968.
3/ McDaniel, Ben. Bulls with a high "PD" sire better cattle. Hoard's Dairyman. September 10, 1968.

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true genetic transmitting ability, the PD, will vary somewhat in its reliability due to the sampling nature of inheritance and various factors that affect the lactation records used in its calculation. These factors have been described by Plowman 4/. The accepted measure of reliability of the PD is termed "Repeatability." This Repeatability value is actually a regression factor used to adjust the calculated daughter-herdmate difference according to the confidence that can be placed on the PD as an accurate estimation of true genetic transmitting ability.

In most cases it is simple for dairymen to separate bulls that are real breed improvers from those that will probably lower production a great deal. However, dairymen have more difficulty in selecting the bulls to use in their herds from among a group of breed improvers. The main source of this difficulty arises from trying to choose between two bulls that have widely differing Repeatability factors on their PD's. Many dairymen hesitate or even refuse to use bulls in their herd that have low Repeatabilities no matter how high the PD's of those bulls may be. Frequently, they feel that a low Repeatability inherently means that the PD is inaccurate or even grossly biased. All evidence indicates that the best use of Repeatability is as a guide to how much you should use any individual bull. A concerted educational effort by Extension Dairymen, AI organizations, breed associations, farm publications, and USDA has largely overcome this misunderstanding of the term "Repeatability." If you have questions on the proper use of Repeatability, please refer to the article by Dickinson and McDaniel 5/.

Dairymen often ask, "How do I judge whether a specific bull has a higher true genetic transmitting ability than another specific bull if they have different PD's and Repeatabilities?" Procedures for making such a decision have recently been developed by F. R. Allaire and were reported

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4/ Plowman, R. D. Notes and concepts used in USDA sire summary procedures. U.S. Department of Agr., Dairy Herd Impr. Letter. April 1968.
5/ Dickinson, Frank N., and B. T. McDaniel. How to use the new Repeatability factor when picking sires for your herd. Hoard's Dairyman. September 10, 1968.

at the 1968 meeting of the American Dairy Science Association [6]. These procedures can be used to compute the probability that one bull is superior to another bull in true genetic transmitting ability, given the PD's and Repeatabilities of the two bulls in question.

Tables and procedures based on Allaire's work are included here and can be used by dairymen to determine the probability, or odds, that any one bull has a true genetic transmitting ability superior to that of any other bull. Taken into account in these tables are the breed of the bulls, their individual Repeatabilities, and the amount that the PD of the higher bull exceeds the PD of the lower bull.

The probabilities in table 1 should be used for comparing bulls of the Ayrshire, Guernsey, and Jersey breeds for milk yield. The probabilities in table 2 should be used for comparing bulls of the Holstein and Brown Swiss breeds. These divisions are based on USDA research [7] showing that the variation among bulls of the first three breeds is about 400 pounds of milk, and that the variation among bulls of the latter two breeds is about 550 pounds of milk.

The probabilities in table 3 can be used to compare bulls of all the dairy breeds on their ability to transmit fat yield.

For those who prefer to think of these probabilities in terms of odds, the tabulation on the following page shows the relation between probabilities expressed as percents and as odds.

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[6] Allaire, F. R. Probabilities arising from dairy sire evaluation models. Jour. of Dairy Sci. 51:958, and mimeographed handout, 4 p. 1968.

[7] McDaniel, B. T., and R. D. Plowman. Distributions of Predicted Differences by milk in the dairy breeds. 1967. (Unpublished.)

Percent	Odds	Percent	Odds
50	1:1	80	4:1
55	6:5	83	5:1
57	4:3	86	6:1
60	3:2	89	8:1
63	5:3	90	9:1
67	2:1	91	10:1
70	7:3	94	15:1
75	3:1	96	20:1

In using these tables the assumption is made that the daughters of the bulls being compared received the same feeding and managemental care as did other cows in the same herds. If preferential treatment has affected the records of the daughters of either of the bulls being compared, the probabilities in these tables will not be correct. The error in the probability will be directly proportionate to the bias in the PD. However, research results obtained by USDA 8/ and at Cornell University 9/ have indicated that in the vast majority of cases preferential treatment has not caused serious biases in PD of low Repeatability.

To use these probability tables, obtain the PD and the Repeatabilities of the two bulls that are to be compared and use the following procedures:

> First, compute the superiority of the PD of the higher bull in pounds (i.e., higher PD minus lower PD). That difference in the PD will tell you which column of table 1 or table 2 to look in (or table 3 if you are comparing PD's for fat).
>
> Second, select the row you should look across according to the Repeatabilities of the two bulls.
>
> Third, find the place in the table where the column that you are looking down intersects with the row that you are looking across. The figure at that

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8/ McDaniel, B. T. Unpublished research on relation between initial and later sire summaries. 1964.

9/ Meek, A. M., and L. D. Van Vleck. Relations between sire proofs. Jour. of Dairy Sci. 47:642-645. 1964.

point in the table is the probability that the bull with the higher PD is superior in true genetic transmitting ability to the bull with the lower PD.

It does not matter which of the bulls has the higher Repeatability. Thus, if one bull has a 20 percent Repeatability and the other bull has a 60 percent Repeatability you would look in the row that corresponds to a 20 percent Repeatability for "lower" and a 60 percent Repeatability for "higher."

Here is an example of steps to follow in using this procedure. Suppose you are trying to judge between two Holstein bulls, which we will call Bull A and Bull B, and their summaries are as follows:

Bull A

PD for milk yield = +307 pounds
Repeatability = 60 percent

Bull B

PD for milk yield = +457 pounds
Repeatability = 20 percent

Step 1: Subtract the PD of Bull A from the PD of Bull B, which equals 457 - 307 or 150 pounds. Then find the column in table 2 with the heading 150.

Step 2: Find the row that corresponds most closely to a 20 percent Repeatability for the "lower" Repeatability and a 60 percent Repeatability for the "higher."

Step 3: Now look down the column with the heading 150 and across the row labeled 20 and 60 percent to the point where they intersect. You will figure out that the point of intersection is 59, which means that the probability that the bull with the higher PD (Bull B) has a higher true genetic transmitting ability than the bull with the lower PD (Bull A) is 59 percent.

If you wish to convert 59 percent to odds, referral to the tabulation at the top of page 4 will indicate that

59 percent probability is approximately equivalent to 3:2 odds that Bull B has a higher true genetic transmitting ability for milk production than does Bull A.

It is not practical, nor is it necessary, to show all possible combinations of Repeatabilities and differences between bulls because this would result in tables too large and too numerous for practical use. Comparisons that fall between the values listed in these tables can be safely made without much error by using the closest figures that appear on the tables. The probabilities obtained by this procedure will be very close to the true probability.

CALCULATION OF EXACT PROBABILITIES

For those who wish to calculate the exact probabilities, a computing version of Allaire's formula is as follows:

$$\text{Table value} = \frac{\text{PD (high) minus PD (low)}}{\text{Breed std.dev. x } \sqrt{2.00 - \text{Rept.(high)} - \text{Rept.(low)}}}$$

For this calculation, Repeatability (Rept.) is expressed as a decimal proportion instead of a percent (i.e., 20 percent = 0.20; 80 percent = 0.80; etc.) The breed standard deviation (breed std. dev.) equals 400 pounds for Ayrshire, Guernsey, and Jersey milk yields, and equals 550 pounds for Holstein and Brown Swiss milk yields. The standard deviation equals 20 pounds for fat yields of all breeds. The probability percentages corresponding to values computed by Allaire's formula appear on the following page.

Table value	Percent of probability
0.01	50
0.02 - .03	51
.04 - .06	52
.07 - .08	53
.09 - .11	54
.12 - .13	55
.14 - .16	56
.17 - .18	57
.19 - .21	58
.22 - .24	59
.25 - .26	60
.27 - .29	61
.30 - .31	62
.32 - .34	63
.35 - .37	64
.38 - .39	65
.40 - .42	66
.43 - .45	67
.46 - .48	68
.49 - .51	69
.52 - .53	70
.54 - .56	71
.57 - .59	72
.60 - .62	73
.63 - .65	74
.66 - .69	75
.70 - .72	76
0.73 - 0.75	77
.76 - .78	78
.79 - .82	79
.83 - .85	80
.86 - .89	81
.90 - .93	82
.94 - .97	83
.98 - 1.01	84
1.02 - 1.05	85
1.06 - 1.10	86
1.11 - 1.15	87
1.16 - 1.20	88
1.21 - 1.25	89
1.26 - 1.31	90
1.32 - 1.37	91
1.38 - 1.43	92
1.44 - 1.51	93
1.52 - 1.59	94
1.60 - 1.69	95
1.70 - 1.81	96
1.82 - 1.96	97
1.97 - 2.17	98
2.18 - 2.39	99

As an example, suppose we have two Holstein bulls with the following summaries:

Bull C: 19 percent Repeatability, +438 PD for milk yield

Bull D: 53 percent Repeatability, +381 PD for milk yield

$$\text{Table value} = \frac{57}{550 \times \sqrt{2.0 - 0.19 - 0.53}}$$

$$= \frac{57}{550 \times \sqrt{1.28}}$$

$$= \frac{57}{550 \times 1.13} = \frac{57}{621.5} = 0.09$$

If we look up 0.09 in the above tabulation, we find a value of 54. Thus, the probability that Bull C is superior to Bull D is 54 percent, or about 7 to 6 odds.

To ease the effort necessary to compute exact probabilities, the proper denominators for various combinations of Repeatabilities, breed, and milk and fat are given in table 4. To find the proper line in the table, merely add the Repeatabilities of the two bulls you are comparing. In our earlier example, on page 12 these would be 60 + 20, or a sum of 80. Looking in table 4 under column 3, we find a value of 602. The rather small changes in the denominators with the increments of 5 percent indicate that the value just below the sum of the Repeatabilities can be used without much error when the sum falls between the increments. In our example on computing exact probabilities, the sum of the Repeatabilities was 72 (19 + 53), and we calculated a denominator of 621.5. Looking in the table for the proper denominator, we find a value of 627, which is quite close.

TABLE 1.--Probability that the bull with the higher Predicted Difference of a pair of Ayrshire, Guernsey, or Jersey bulls has the greater true genetic transmitting ability for milk yield

Repeatability		Superiority of Predicted Difference (PD) on the higher PD bull (pounds) for milk yield												
Lower	Higher	50	100	150	200	250	300	400	500	600	700	800	900	1,000
--- Percent ---		Percent												
20	20	53	57	61	65	68	72	78	83	88	91	94	96	98
	30	54	58	61	65	69	73	79	84	89	92	95	97	98
	40	54	58	62	66	70	73	80	85	89	93	95	97	98
	50	54	58	62	66	70	74	81	86	90	94	96	98	99
	60	54	58	63	67	71	75	82	87	91	94	96	98	99
	70	54	59	63	68	72	76	83	88	92	95	97	98	99
	80	54	59	64	69	73	77	84	89	93	96	98	99	--[1]
	90	55	60	65	70	74	78	85	90	94	97	98	99	--
	99	55	60	66	71	75	79	86	91	95	97	99	--	--
30	30	54	58	62	66	70	73	80	85	89	93	95	97	98
	40	54	58	62	66	70	74	81	86	90	94	96	98	99
	50	54	58	63	67	71	75	82	87	91	94	96	98	99
	60	54	59	63	68	72	76	83	88	92	95	97	98	99
	70	54	59	64	69	73	77	84	89	93	96	98	99	--
	80	55	60	65	70	74	78	85	90	94	97	98	99	--
	90	55	60	66	71	75	79	86	92	95	97	99	--	--
	99	55	61	67	72	77	81	88	93	96	98	99	--	--
40	40	54	58	63	67	71	75	82	87	91	94	96	98	99
	50	54	59	63	68	72	76	83	88	92	95	97	98	99
	60	54	59	64	69	73	77	84	89	93	96	98	99	--
	70	55	60	65	70	74	78	85	90	94	97	98	99	--
	80	55	60	66	71	75	79	86	92	95	97	99	--	--
	90	55	61	67	72	77	81	88	93	96	98	99	--	--
	99	56	62	68	74	79	83	90	94	97	99	--	--	--
50	50	54	59	64	69	73	77	84	89	93	96	98	99	--
	60	55	60	65	70	74	78	85	90	94	97	98	99	--
	70	55	60	66	71	75	79	86	92	95	97	99	--	--
	80	55	61	67	72	77	81	88	93	96	98	99	--	--
	90	56	62	68	74	79	83	90	95	97	99	--	--	--
	99	56	63	70	75	81	85	92	96	98	99	--	--	--
60	60	55	60	66	71	75	79	86	92	95	97	99	--	--
	70	55	61	67	72	77	81	88	93	96	98	99	--	--
	80	56	62	68	74	79	83	90	95	97	99	--	--	--
	90	56	63	70	75	81	85	92	96	98	99	--	--	--
	99	57	65	72	78	83	88	94	97	99	--	--	--	--
70	70	56	62	68	74	79	83	90	95	97	99	--	--	--
	80	56	63	70	75	81	85	92	96	98	99	--	--	--
	90	57	65	72	78	83	88	94	98	99	--	--	--	--
	99	58	67	75	81	87	91	96	99	--	--	--	--	--
80	80	57	65	72	78	83	88	94	98	99	--	--	--	--
	90	58	67	75	82	87	91	96	99	--	--	--	--	--
	99	60	70	79	86	91	95	99	--	--	--	--	--	--
90	90	60	71	79	86	92	95	99	--	--	--	--	--	--
	99	64	77	87	93	97	99	--	--	--	--	--	--	--
99	99	81	96	99	--	--	--	--	--	--	--	--	--	--

[1] Dashes indicate probability over 99 percent.

TABLE 2.--Probability that the bull with the higher Predicted Difference of a pair of Holstein or Brown Swiss bulls has the greater true genetic transmitting ability for milk yield

Repeatability		Superiority of Predicted Difference (PD) on the higher PD bull (pounds) for milk yield												
Lower	Higher	50	100	150	200	250	300	400	500	600	700	800	900	1,000
--- Percent ---		Percent												
20	20	52	55	58	61	63	66	71	76	80	84	87	90	92
	30	52	55	58	61	64	67	72	77	81	85	88	91	93
	40	52	56	59	61	64	67	73	77	82	86	89	91	94
	50	52	56	59	62	65	68	73	78	83	86	90	92	94
	60	53	56	59	63	66	68	74	79	84	87	90	93	95
	70	53	56	60	63	66	70	75	80	85	88	91	94	96
	80	53	57	60	64	67	70	76	81	86	90	93	95	96
	90	53	57	61	64	68	71	77	83	87	91	94	96	97
	99	54	58	61	65	69	72	79	84	88	92	95	96	98
30	30	52	56	59	61	64	67	73	77	82	86	89	91	94
	40	52	56	59	62	65	68	73	78	83	86	90	92	94
	50	53	56	59	63	66	68	74	79	84	87	90	93	95
	60	53	56	60	63	66	70	75	80	85	88	91	94	96
	70	53	57	60	64	67	70	76	81	86	90	93	95	96
	80	53	57	61	64	68	71	77	83	87	91	94	96	97
	90	54	58	61	65	69	72	79	84	88	92	95	96	98
	99	54	58	62	66	70	74	80	86	90	93	96	97	98
40	40	53	56	59	63	66	68	74	79	84	87	90	93	95
	50	53	56	60	63	66	70	75	80	85	88	91	94	96
	60	53	57	60	64	67	70	76	81	86	90	93	95	96
	70	53	57	61	64	68	71	77	83	87	91	94	96	97
	80	54	58	61	65	69	72	79	84	88	92	95	96	98
	90	54	58	62	66	70	74	80	86	90	93	96	97	98
	99	54	59	63	67	72	75	82	87	92	95	97	98	99
50	50	53	57	60	64	67	70	76	81	86	90	93	95	96
	60	53	57	61	64	68	71	77	83	87	91	94	96	97
	70	54	58	61	65	69	72	79	84	88	92	95	96	98
	80	54	58	62	66	70	74	80	86	90	93	96	97	98
	90	54	59	63	67	72	75	82	88	92	95	97	98	99
	99	54	59	64	69	73	77	84	90	93	96	98	99	--[1]
60	60	54	58	61	65	69	72	79	84	88	92	95	96	98
	70	54	58	62	66	70	74	80	86	90	93	96	97	98
	80	54	59	63	67	72	75	82	88	92	95	97	98	99
	90	54	59	64	69	74	78	84	90	94	96	98	99	--
	99	55	61	66	71	75	80	87	92	95	98	99	--	--
70	70	54	59	63	67	72	75	82	88	92	95	97	98	99
	80	54	59	64	69	74	78	84	90	94	96	98	99	--
	90	55	61	66	71	76	80	87	92	96	98	99	--	--
	99	56	62	68	74	79	83	90	95	97	99	--	--	--
80	80	55	61	66	71	76	80	87	92	96	98	99	--	--
	90	56	63	68	74	79	84	90	95	98	99	--	--	--
	99	57	65	72	78	84	88	94	98	99	--	--	--	--
90	90	58	65	72	79	84	88	95	98	99	--	--	--	--
	99	60	70	79	86	91	95	99	--	--	--	--	--	--
99	99	74	90	97	99	--	--	--	--	--	--	--	--	--

[1] Dashes indicate probability over 99 percent.

TABLE 3.--Probability that the bull with the higher Predicted Difference of a pair of bulls of any breed has the greater true genetic transmitting ability for fat yield

Repeatability		Superiority of Predicted Difference (PD) on the higher PD bull (pounds) for fat yield												
Lower	Higher	50	100	150	200	250	300	400	500	600	700	800	900	1,000
--- Percent ---		Percent												
20	20	57	65	72	78	83	88	91	94	96	98	98	99	--1/
	30	58	65	73	79	84	89	92	95	97	98	99	--	--
	40	58	66	73	80	85	89	93	95	97	98	99	--	--
	50	58	66	74	81	86	90	94	96	98	99	--	--	--
	60	58	67	75	82	87	91	94	96	98	99	--	--	--
	70	59	68	76	83	88	92	95	97	98	99	--	--	--
	80	59	69	77	84	89	93	96	98	99	--	--	--	--
	90	60	70	78	85	90	94	97	98	99	--	--	--	--
	99	60	71	79	86	91	95	97	99	--	--	--	--	--
30	30	58	66	73	80	85	89	93	95	97	98	99	--	--
	40	58	66	74	81	86	90	94	96	98	99	--	--	--
	50	58	67	75	82	87	91	94	96	98	99	--	--	--
	60	59	68	76	83	88	92	95	97	98	99	--	--	--
	70	59	69	77	84	89	93	96	98	99	--	--	--	--
	80	60	70	78	85	90	94	97	98	99	--	--	--	--
	90	60	71	79	86	92	95	97	99	--	--	--	--	--
	99	61	72	81	88	93	96	98	99	--	--	--	--	--
40	40	58	67	75	82	87	91	94	96	98	99	--	--	--
	50	59	68	76	83	88	92	95	97	98	99	--	--	--
	60	59	69	77	84	89	93	96	98	99	--	--	--	--
	70	60	70	78	85	90	94	97	98	99	--	--	--	--
	80	60	71	79	86	92	95	97	99	--	--	--	--	--
	90	61	72	81	88	93	96	98	99	--	--	--	--	--
	99	62	74	83	90	94	97	99	--	--	--	--	--	--
50	50	59	69	77	84	89	93	96	98	99	--	--	--	--
	60	60	70	78	85	90	94	97	98	99	--	--	--	--
	70	60	71	79	86	92	95	97	99	--	--	--	--	--
	80	61	72	81	88	93	96	98	99	--	--	--	--	--
	90	62	74	83	90	95	97	99	--	--	--	--	--	--
	99	63	75	85	92	96	98	99	--	--	--	--	--	--
60	60	60	71	79	86	92	95	97	99	--	--	--	--	--
	70	61	72	81	88	93	96	98	99	--	--	--	--	--
	80	62	74	83	90	95	97	99	--	--	--	--	--	--
	90	63	75	85	92	96	98	99	--	--	--	--	--	--
	99	65	78	88	94	97	99	--	--	--	--	--	--	--
70	70	62	74	83	90	95	97	99	--	--	--	--	--	--
	80	63	75	85	92	96	98	99	--	--	--	--	--	--
	90	65	78	88	94	98	99	--	--	--	--	--	--	--
	99	67	81	91	96	99	--	--	--	--	--	--	--	--
80	80	65	78	88	94	98	99	--	--	--	--	--	--	--
	90	67	82	91	96	99	--	--	--	--	--	--	--	--
	99	70	86	95	99	--	--	--	--	--	--	--	--	--
90	90	71	86	95	99	--	--	--	--	--	--	--	--	--
	99	77	93	99	--	--	--	--	--	--	--	--	--	--
99	99	96	99	--	--	--	--	--	--	--	--	--	--	--

1/ Dashes indicate probability over 99 percent.

TABLE 4.--Denominators used in computing exact probabilities that one bull is superior to another

Sum of Repeat-abilities 1 and 2	Denominators			Sum of Repeat-abilities 1 and 2	Denominators		
	Milk yield		Fat yield		Milk yield		Fat yield
	Ayrshire Guernsey Jersey	Holstein Brown Sw.	All breeds		Ayrshire Guernsey Jersey	Holstein Brown Sw.	All breeds
Percent	Pounds	Pounds	Pounds	Percent	Pounds	Pounds	Pounds
35	514	706	25.7	125	346	476	17.3
40	506	696	25.3	130	335	460	16.7
45	498	685	24.9	135	322	443	16.1
50	490	674	24.5	140	310	426	15.5
55	482	662	24.1	145	297	408	14.8
60	473	651	23.7	150	283	389	14.1
65	465	639	23.2	155	268	369	13.4
70	456	627	22.8	160	253	348	12.6
75	447	615	22.4	165	237	325	11.8
80	438	602	21.9	170	219	301	11.0
85	429	590	21.4	175	200	275	10.0
90	420	577	21.0	180	179	246	8.9
95	410	564	20.5	183	165	227	8.2
100	400	550	20.0	187	144	198	7.2
105	390	536	19.5	190	126	174	6.3
110	379	522	19.0	192	113	156	5.6
115	369	507	18.4	195	89	123	4.5
120	358	492	17.9	198	57	78	2.8

National Cooperative Dairy Herd Improvement Program
RECORD BOOK
A plan for every size herd
OFFICIAL DHIA OWNER SAMPLER WEIGH-A-DAY-A-MONTH
AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

Dairy-Herd-Improvement Letter
ARS-44-210
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DHIA PARTICIPATION REPORT [1]
January 1, 1969

The National Cooperative Dairy Herd Improvement Program is a composite of the Official DHI [2] (including DHIR), Owner-Sampler, and Weigh-a-Day-a-Month recordkeeping plans. On January 1, 1969, the Program included 60,684 herds consisting of 3,025,414 cows on test, which is 23.2 percent of the Nation's dairy cow population. These figures represent an increase of 0.8 percent of cows on test, a decrease of 2,853 cows, and a decrease of 2,195 herds during the year. Table 1 presents these data and also includes 4,654 herds and 170,756 cows on other testing programs such as Vocational Agriculture, commercial, and private.

Each of the 50 States and Puerto Rico are represented in the total program that includes 1,289 associations and 2,250 supervisors. The participation reports for all testing programs and for the Official DHI, Owner-Sampler, and Weigh-a-Day-a-Month plans are shown in tables 1, 2, 3, and 4, respectively.

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[1] Prepared by F. N. Dickinson, B. T. McDaniel, C. A. Rampendahl, and J. J. Corbin from data supplied by the State Extension Dairymen in Charge of DHIA Testing.

[2] The Official DHI plan was previously designated as Standard DHIA plan.

Issued June 1969

On January 1, 1969, 1,252 fewer herds and 7,024 more cows were on Official DHI test than in the previous year. Average herd size was 60.1 cows, an increase of 2.3 cows per herd over the previous year.

On January 1, 1969, 784 fewer herds and 5,155 fewer cows were on the Owner-Sampler test than in the previous year. Average herd size was 34.6 cows. Wisconsin had 43.9 percent of the Owner-Sampler enrollment. The Weigh-a-Day-a-Month plan had 708 herds consisting of 44,131 cows. Average herd size for this plan was 62.3 cows.

Electronic data processing at State and regional DHIA centers continues to advance as shown in table 5. Electronic processing of Official DHI plan records (including DHIR) has reached 100 percent in 44 States. In the United States, it includes 96.1 percent of the herds and 86.9 percent of the cows on Official DHI. The corresponding values for records of the three plans combined are 91.4 and 86.0 percent, respectively.

The present status and changes since 1906 in Official DHI enrollment are shown in table 6. The number of cows in the program has about doubled since 1950, although the number of herds tested continues to decrease.

Table 7 is a 13-year summary of the production of Official DHI and all U.S. dairy cows. Table 8 shows that the proportion of cows participating in the total DHIA program increased from 9.3 percent in 1956 to 23.2 percent in 1968.

A list of the 256 counties that have 40 percent or more of their dairy cows on one or more of the recordkeeping plans is shown in table 9. Twenty-one percent of the counties have 25 percent or more of their dairy cattle enrolled in one or more recordkeeping plans.

On the last page is an updated list of Extension Dairymen in charge of production testing from information supplied by each State.

LACTATION RECORDS REPORTED IN 1968

In 1968, 1,916,831 Official DHI lactation records were reported to USDA for use in statistical summaries, genetic appraisals, and research. This is 65,557 more than were reported in 1967. Of these, 97.6 percent were reported on magnetic tape and 2.4 percent on punched cards. The records reported by State are summarized in table 10.

Since 1958, the number of cows enrolled in Official DHI has increased 38 percent, while the number of lactation records reported to the USDA has increased 144 percent. As a result, the proportion of cows on test having reported records has increased from 51 to 90 percent since 1958. This more complete reporting is attributed largely to the continued development of central processing of Official DHI records. An 11-year summary of the records reported since 1958 is shown in table 11.

LACTATION RECORD REJECTS

About 4.8 percent of the lactation records submitted in 1968 were rejected because the editing procedure revealed they contained invalid, conflicting, or questionable data.

The types and frequencies of discrepancies that were noted in the preliminary screening of lactation records are shown in table 12. The major problem is the lack of identification on sires and dams of registered cows, resulting in more than 6,500 discrepancies. In 3,400 records the breed codes of cows with registration numbers were different from those of their sires or dams. Care in following the uniform eartag series numbers or in reporting all identification on registered cows will greatly reduce the number of records that are screened for such errors as those above. It will also reduce the effort made by farmers, DHIA, and Dairy Records Processing Centers to correct these mistakes. Another major problem was zero reported for sire and dam breed.

Reasons for rejecting records in the main USDA edit and the number of records so affected are shown in table 13.

Over 70,000 records were rejected; the major problems were conflicting calving dates between two or more lactations of the same cow, conflicting birth dates between two daughters of the same dam, inconsistency with previous identification supplied (sire, dam, or birth date), and improper cow, sire, or dam numbers. A substantial portion of the rejected records had errors in more than one field because more than 75,000 error conditions were recognized.

The material in table 13 is based only on registered cows or grade cows for which sires were reported. Thus, it appears that the error rate in records identified by sire is near 8 percent, because a substantial number of lactation records continue to be reported without sire identification.

You may note that most of the tables show error conditions rather than records in error. This results because records are edited for all remaining fields after the first conflict is found. The fact that error conditions exceed the number of rejected records indicates that many records continue to contain more than one error.

Table 14 shows the density of the National Cooperative Dairy Herd Improvement program percentage of cows in program January 1, 1969. The top five ranking States were California, Nevada, South Carolina, Arizona, and Connecticut.

TABLE 1.--The National Cooperative Dairy Herd Improvement Program and other testing programs (January 1, 1969)

State	Counties	Asso-ciations	Super-visors	Official DHI		Owner-Sampler		Weigh-a-Day-a-Month		Total		Milk cows in U.S.	
				Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Total 1/	In all plans
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Thousands	Percent
Ala------	51	22	25	308	32,277	5	360	7	509	320	33,146	143	23.2
Alaska---	2	1	2	5	232	6	287	---	-----	11	519	1.8	28.8
Ariz-----	5	4	8	90	20,574	---	-----	---	-----	90	20,574	51	40.3
Ark------	31	14	20	95	5,098	112	4,122	5	150	212	9,370	102	9.2
Calif----	45	30	114	1,711	363,627	120	6,930	---	-----	1,831	370,557	781	47.4
Colo-----	20	13	19	259	18,496	23	1,029	---	-----	282	19,525	99	19.7
Conn-----	8	7	22	370	23,560	66	2,729	4	349	440	26,638	67	39.8
Del------	3	3	4	82	4,661	7	185	3	58	92	4,904	15	32.7
Fla------	31	9	12	94	20,584	15	5,507	15	4,258	124	30,349	182	16.7
Ga-------	95	29	30	380	31,507	7	562	44	4,955	431	37,024	139	26.6
Hawaii---	3	1	2	12	3,032	3	878	---	-----	15	3,910	13.5	29.0
Idaho----	30	30	31	518	25,786	19	553	---	-----	537	26,339	156	16.9
Ill------	86	54	76	1,311	57,483	342	11,635	186	6,647	1,839	75,765	330	23.0
Ind------	78	54	71	968	39,409	310	12,642	---	-----	1,278	52,051	252	20.7
Iowa-----	97	72	104	1,686	62,113	1,276	35,089	3	50	2,965	97,252	569	17.1
Kans-----	86	51	54	800	39,640	150	5,233	4	100	954	44,973	212	21.2
Ky-------	67	36	42	511	23,733	39	1,612	13	1,019	563	26,364	367	7.2
La-------	35	25	27	116	10,549	2	127	169	11,489	287	22,165	180	12.3
Maine----	16	13	24	362	17,905	84	3,357	---	-----	446	21,262	69	30.8
Md-------	17	17	32	641	41,040	74	3,292	---	-----	715	44,332	170	26.1
Mass-----	11	10	21	418	20,032	60	1,924	---	-----	478	21,956	69	31.8
Mich-----	80	55	91	1,571	79,632	1,281	46,969	---	-----	2,852	126,601	473	26.8
Minn-----	84	77	199	3,388	123,790	2,407	70,922	---	-----	5,795	194,712	1,057	18.4
Miss-----	51	19	26	282	22,907	6	511	15	946	303	24,364	209	11.7
Mo-------	75	44	56	548	29,323	207	7,716	---	-----	755	37,039	380	9.7
Mont-----	16	6	7	81	5,090	36	3,310	---	-----	117	8,400	46	18.3
Nebr-----	59	31	35	405	19,338	75	2,810	37	927	517	23,075	210	11.0
Nev------	6	2	2	61	4,748	2	1,408	---	-----	63	6,156	13.7	44.9
N. H-----	10	9	15	217	10,313	57	2,078	10	570	284	12,961	39	33.2
N. J-----	11	8	21	356	22,488	55	5,647	---	-----	411	28,135	79	35.6
N. Mex---	9	5	6	28	6,790	4	2,014	---	-----	32	8,804	38	23.2
N. Y-----	49	43	180	3,562	188,007	2,342	91,797	---	-----	5,904	279,804	1,039	26.9
N. C-----	82	42	55	748	50,377	40	1,728	44	2,229	832	54,334	193	28.2
N. Dak---	39	14	16	151	6,271	24	650	17	635	192	7,556	156	4.8
Ohio-----	84	73	141	2,012	88,729	1,269	38,827	---	-----	3,281	127,556	475	26.9
Okla-----	52	15	17	295	19,188	50	2,531	2	70	347	21,789	155	14.1
Oreg-----	25	15	22	345	26,600	100	3,920	---	-----	445	30,520	113	27.0
Pa-------	60	60	167	3,584	157,838	1,293	43,040	---	-----	4,877	200,878	728	27.6
P. R-----	7	1	1	7	1,007	-----	-----	25	5,132	32	6,139	---	----
R. I-----	4	2	3	41	1,908	-----	-----	---	-----	41	1,908	8.1	23.6
S. C-----	36	24	25	275	29,261	3	152	5	153	283	29,566	72	41.1
S. Dak---	48	20	21	162	6,914	411	13,225	---	-----	573	20,139	202	10.0
Tenn-----	68	36	35	497	30,840	5	202	31	1,322	533	32,364	329	9.8
Tex------	84	23	27	328	33,402	27	1,520	14	1,008	369	35,930	365	9.8
Utah-----	19	16	17	401	22,318	25	1,031	---	-----	426	23,349	75	31.1
Vt-------	14	27	53	710	38,335	591	26,649	1	50	1,302	65,034	209	31.1
Va-------	79	38	50	944	63,789	53	2,272	8	274	1,005	66,335	231	28.7
Wash-----	29	22	44	633	42,714	39	1,531	---	-----	672	44,245	186	23.8
W. Va----	27	12	17	180	9,661	21	737	46	1,231	247	11,629	67	17.4
Wis------	70	50	156	3,030	134,594	11,192	370,065	---	-----	14,222	504,659	1,887	26.7
Wyo------	8	5	5	38	1,443	24	1,015	---	-----	62	2,458	19.5	12.6
Total or percent: The Natl. Coop.DHI Program	2,102	1,289	2,250	35,617	2,138,953	24,359	842,330	708	44,131	60,684	3,025,414	13,022	23.2
All testing programs 2/	--	-----	-----	------	---------	------	-------	---	------	65,338	3,196,170	------	24.5

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

2/ The following number of herds and cows are on other testing programs such as Vocational Agriculture, commercial, private, etc., by State: Arizona, 40 herds, 8,540 cows; California, 69 herds, 12,383 cows; Colorado, 22 herds, 2,029 cows; Connecticut, 20 herds, 2,000 cows; Iowa, 300 herds, 5,000 cows; Michigan, 262 herds, 9,774 cows; New York, 32 herds, 1,614 cows; North Dakota, 78 herds, 1,594 cows; Pennsylvania, 570 herds, 24,510 cows; South Carolina, 2 herds, 139 cows; Washington, 22 herds, 2,826 cows; Wisconsin, 3,237 herds, 100,347 cows. Total = 4,654 herds, 170,756 cows.

TABLE 2.--Official DHI recordkeeping in the United States (January 1, 1969)

State	Counties	Herds	Cows	Change from 1-1-68	Av. cows per herd	All milk cows 1/	DHI cows as pct. of all milk cows 2/	Change from 1-1-68
	Number	Number	Number	Number	Number	Thousands	Percent	Percent
Ala---------	50	308	32,277	+172	104.8	143	22.6	+1.2
Alaska------	2	5	232	+36	46.4	1.8	12.9	+2.6
Ariz--------	5	90	20,574	+6,269	228.6	51	40.3	+12.3
Ark---------	13	95	5,098	+723	53.7	102	5.0	+0.9
Calif-------	44	1,711	363,627	-7,602	212.5	781	46.6	-.9
Colo--------	20	259	18,496	-773	71.4	99	18.7	-1.0
Conn--------	8	370	23,560	+883	63.7	67	35.2	+2.3
Del---------	3	82	4,661	+425	56.8	15	31.1	+4.6
Fla---------	31	94	20,584	-494	219.0	182	11.3	-.3
Ga----------	86	380	31,507	+389	82.9	139	22.7	+1.1
Hawaii------	1	12	3,032	-1,290	252.7	13.5	22.5	-7.5
Idaho-------	29	518	25,786	+3,298	49.8	156	16.5	+2.1
Ill---------	81	1,311	57,483	-551	43.8	330	17.4	+1.2
Ind---------	78	968	39,409	-4,350	40.7	252	15.6	-.6
Iowa--------	96	1,686	62,113	+1,357	36.8	569	10.9	+1.1
Kans--------	86	800	39,640	+1,478	49.6	212	18.7	+1.4
Ky----------	62	511	23,733	+236	46.4	367	6.5	+.3
La----------	25	116	10,549	+2,193	90.9	180	5.9	+1.5
Maine-------	16	362	17,905	-877	49.5	69	25.9	-.2
Md----------	17	641	41,040	-674	64.0	170	24.1	+.1
Mass--------	11	418	20,032	+2	47.9	69	29.0	+1.9
Mich--------	70	1,571	79,632	+1,574	50.7	473	16.8	+1.0
Minn--------	84	3,388	123,790	+4,767	36.5	1,057	11.7	+.8
Miss--------	48	282	22,907	+1,019	81.2	209	11.0	+1.1
Mo----------	73	548	29,323	+3,111	53.5	380	7.7	+1.1
Mont--------	11	81	5,090	+774	62.8	46	11.1	+2.3
Nebr--------	54	405	19,338	+542	47.7	210	9.2	+.8
Nev---------	6	61	4,748	-1,632	77.8	13.7	34.7	-12.6
N. H--------	10	217	10,313	-2,701	47.5	39	26.4	-4.6
N. J--------	10	356	22,488	-1,504	63.2	79	28.5	+.6
N. Mex------	9	28	6,790	-126	242.5	38	17.9	-.3
N. Y--------	49	3,562	188,007	+1,496	52.8	1,039	18.1	+.7
N. C--------	82	748	50,377	+476	67.3	193	26.1	+1.1
N. Dak------	35	151	6,271	+369	41.5	156	4.0	+.6
Ohio--------	83	2,012	88,729	-2,249	44.1	475	18.7	+.4
Okla--------	52	295	19,188	+2,178	65.0	155	12.4	+1.7
Oreg--------	25	345	26,600	+2,405	77.1	113	23.5	+2.8
Pa----------	60	3,584	157,838	-20,365	44.0	728	21.7	-2.3
P. R--------	7	7	1,007	+187	143.9	---	----	----
R. I--------	4	41	1,908	-322	46.5	8.1	23.6	-1.7
S. C--------	35	275	29,261	+2,870	106.4	72	40.6	+5.4
S. Dak------	28	162	6,914	+1,310	42.7	202	3.4	+.7
Tenn--------	62	497	30,840	-171	62.1	329	9.4	+.5
Tex---------	76	328	33,402	+926	101.8	365	9.2	+.7
Utah--------	19	401	22,318	+1,211	55.7	75	29.8	+2.0
Vt----------	13	710	38,335	-786	54.0	209	18.3	+.2
Va----------	77	944	63,789	+833	67.6	231	27.6	+1.5
Wash--------	29	633	42,714	+5,466	67.5	186	23.0	+3.9
W. Va-------	21	180	9,661	+1,294	53.7	67	14.4	+2.9
Wis---------	68	3,030	134,594	+3,351	44.4	1,887	7.1	+.3
Wyo---------	8	38	1,443	-129	38.0	19.5	7.4	-.3
Total, average, or percent--	1,972	35,617	2,138,953	+7,024	60.1	13,022	16.4	+.6

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

2/ Percentage of cows included in the Official DHI (including DHIR) recordkeeping plan.

TABLE 3.--Owner-Sampler recordkeeping in the United States (January 1, 1969)

State	Counties	Herds	Cows	Change from 1-1-68	Av. cows per herd	All milk cows 1/	O.S. cows as pct. of all milk cows 2/	Change from 1-1-68
	Number	Number	Number	Number	Number	Thousands	Percent	Percent
Ala----------	4	5	360	-127	72.0	143	0.3	0
Alaska------	1	6	287	+152	47.8	1.8	15.9	+8.8
Ariz--------	--	----	---	-7,003	----	51	----	-13.7
Ark---------	21	112	4,122	+962	36.8	102	4.0	+1.1
Calif-------	22	120	6,930	-7,140	57.8	781	.9	-0.9
Colo--------	7	23	1,029	-493	44.7	99	1.0	-.6
Conn--------	8	66	2,729	+120	41.3	67	4.1	+.3
Del---------	2	7	185	-68	26.4	15	1.2	-.4
Fla---------	10	15	5,507	+3,527	367.1	182	3.0	+1.9
Ga----------	4	7	562	0	80.3	139	.4	0
Hawaii------	2	3	878	+233	292.7	13.5	6.5	+2.0
Idaho-------	12	19	553	+71	29.1	156	.4	+.1
Ill---------	28	342	11,635	-194	34.0	330	3.5	+.2
Ind---------	29	310	12,642	-1,314	40.8	252	5.0	-.2
Iowa--------	91	1,276	35,089	-1,313	27.5	569	6.2	+.3
Kans--------	39	150	5,233	+817	34.9	212	2.5	+.5
Ky----------	20	39	1,612	+129	41.3	367	.4	0
La----------	2	2	127	-174	63.5	180	.1	-.1
Maine-------	10	84	3,357	-325	40.0	69	4.9	-.2
Md----------	8	74	3,292	+17	44.5	170	1.9	0
Mass--------	8	60	1,924	-559	32.1	69	2.8	-.6
Mich--------	73	1,281	46,969	-2,126	36.7	473	9.9	0
Minn--------	81	2,407	70,922	+7,345	29.5	1,057	6.7	+.9
Miss--------	6	6	511	+19	85.2	209	.2	0
Mo----------	43	207	7,716	+1,857	37.3	380	2.0	+.5
Mont--------	11	36	3,310	+768	91.9	46	7.2	+2.0
Nebr--------	22	75	2,810	-390	37.5	210	1.3	-.1
Nev---------	2	2	1,408	+263	704.0	13.7	10.3	+1.8
N. H--------	9	57	2,078	-481	36.5	39	5.3	-.8
N. J--------	9	55	5,647	+1,876	102.7	79	7.1	+2.7
N. Mex------	2	4	2,014	+241	503.5	38	5.3	+.6
N. Y--------	48	2,342	91,797	-3,001	39.2	1,039	8.8	-.1
N. C--------	17	40	1,728	+199	43.2	193	.9	+.1
N. Dak------	13	24	650	-110	27.1	156	.4	0
Ohio--------	77	1,269	38,827	-2,591	30.6	475	8.2	-.1
Okla--------	25	50	2,531	-465	50.6	155	1.6	-.3
Oreg--------	21	100	3,920	-510	39.2	113	3.5	-.3
Pa----------	60	1,293	43,040	+3,185	33.3	728	5.9	+.5
P. R--------	--	-----	------	------	----	---	---	----
R. I--------	--	-----	------	------	----	8.1	---	----
S. C--------	2	3	152	+40	50.7	72	.2	+.1
S. Dak------	57	411	13,225	+3,125	32.2	202	6.5	+1.7
Tenn--------	4	5	202	-29	40.4	329	.1	0
Tex---------	14	27	1,520	-43	56.3	365	.4	0
Utah--------	3	25	1,031	-9	41.2	75	1.4	0
Vt----------	13	591	26,649	-44	45.1	209	12.8	+.4
Va----------	16	53	2,272	-113	42.9	231	1.0	0
Wash--------	15	39	1,531	+323	39.3	186	.8	+.2
W. Va-------	7	21	737	-316	35.1	67	1.1	-.3
Wis---------	70	11,192	370,065	-1,787	33.1	1,887	19.6	+.4
Wyo---------	3	24	1,015	+301	42.3	19.5	5.2	+1.7
Total, average,or percent--	1,051	24,359	842,330	-5,155	34.6	13,022	6.5	+.2

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

2/ Percentage of cows included in the Owner-Sampler recordkeeping plan.

TABLE 4.--Weigh-a-Day-a-Month recordkeeping in the United States (January 1, 1969)

State	Counties	Herds	Cows	Change from 1-1-68	Av. cows per herd	All milk cows 1/	WADAM cows as pct. of all milk cows 2/	Change from 1-1-68
	Number	Number	Number	Number	Number	Thousands	Percent	Percent
Ala----------	5	7	509	-422	72.7	143	0.4	-0.2
Alaska-------	--	---	------	------	-----	1.8	---	----
Ariz---------	--	---	------	------	-----	51	---	----
Ark----------	5	5	150	-250	30.0	102	.1	-.3
Calif--------	--	---	------	------	-----	781	---	----
Colo---------	--	---	------	------	-----	99	---	----
Conn---------	1	4	349	-100	87.3	67	.5	-.2
Del----------	1	3	58	+2	19.3	15	.4	0
Fla----------	8	15	4,258	-60	283.9	182	2.3	-.1
Ga-----------	27	44	4,955	-1,591	112.6	139	3.6	-.9
Hawaii-------	--	---	------	------	-----	13.5	---	----
Idaho--------	--	---	------	------	-----	156	---	----
Ill----------	39	186	6,647	-294	35.7	330	2.0	+.1
Ind----------	--	---	------	------	-----	252	---	----
Iowa---------	2	3	50	+5	16.7	569	---	----
Kans---------	1	4	100	-452	25.0	212	---	-.2
Ky-----------	5	13	1,019	-489	78.4	367	.3	-.1
La-----------	23	169	11,489	-1,573	68.0	180	6.4	-.5
Maine--------	--	---	------	------	-----	69	---	----
Md-----------	--	---	------	------	-----	170	---	----
Mass---------	--	---	------	------	-----	69	---	----
Mich---------	--	---	------	------	-----	473	---	----
Minn---------	--	---	------	------	-----	1,057	---	----
Miss---------	5	15	946	-381	63.1	209	.5	-.1
Mo-----------	--	---	------	------	-----	380	---	----
Mont---------	--	---	------	------	-----	46	---	----
Nebr---------	17	37	927	-23	25.1	210	.4	0
Nev----------	--	---	------	------	-----	13.7	---	----
N. H---------	3	10	570	+243	57.0	39	1.5	+.7
N. J---------	--	---	------	------	-----	79	---	----
N. Mex-------	--	---	------	------	-----	38	---	----
N. Y---------	--	---	------	------	-----	1,039	---	----
N. C---------	22	44	2,229	-714	50.7	193	1.2	-.3
N. Dak-------	12	17	635	-7	37.4	156	.4	0
Ohio---------	--	---	------	------	-----	475	---	----
Okla---------	2	2	70	0	35.0	155	---	----
Oreg---------	--	---	------	------	-----	113	---	----
Pa-----------	--	---	------	------	-----	728	---	----
P. R---------	19	25	5,132	+1,598	205.3	-----	---	----
R. I---------	--	---	------	------	-----	8.1	---	----
S. C---------	3	5	153	-109	30.6	72	.2	-.1
S. Dak-------	--	---	------	------	-----	202	---	----
Tenn---------	6	31	1,322	+8	42.6	329	.4	0
Tex----------	6	14	1,008	+212	72.0	365	.3	+.1
Utah---------	--	---	------	------	-----	75	---	----
Vt-----------	1	1	50	0	50.0	209	---	----
Va-----------	4	8	274	-222	34.3	231	.1	-.1
Wash---------	--	---	------	------	-----	186	---	----
W. Va--------	16	46	1,231	-103	26.8	67	1.8	0
Wis----------	--	---	------	------	-----	1,887	---	----
Wyo----------	--	---	------	------	-----	19.5	---	----
Total, average, or percent---	233	708	44,131	-4,722	62.3	13,022	.3	-.1

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

2/ Percentage of cows included in the Weigh-a-Day-a-Month recordkeeping plan.

TABLE 5.--Herds and cows enrolled in State and regional computing centers (January 1, 1969)

State	Official DHI (incl. DHIR)				Dairy Herd Improvement Registry		Owner-Sampler		Total machine processing 1/		Machine processing as percent of total recordkeeping 1/	
	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows
	Number	Number	Pct.2/	Pct.2/	Number	Number	Number	Number	Number	Number	Pct.	Pct.
Ala-------	308	32,277	100.0	100.0	14	1,306	5	360	317	32,932	99.1	99.4
Alaska----	5	232	100.0	100.0	2	49	6	287	11	519	100.0	100.0
Ariz------	53	9,754	58.9	47.4	18	3,115	-----	------	53	9,754	58.9	47.4
Ark-------	95	5,098	100.0	100.0	16	793	112	4,122	207	9,220	97.6	98.4
Calif-----	379	98,046	22.2	27.0	101	24,769	7	556	386	98,602	21.1	26.6
Colo------	259	18,496	100.0	100.0	40	1,603	23	1,029	282	19,525	100.0	100.0
Conn------	370	23,560	100.0	100.0	58	3,910	66	2,729	440	26,638	100.0	100.0
Del-------	82	4,661	100.0	100.0	8	515	7	185	89	4,846	96.7	98.8
Fla-------	94	20,584	100.0	100.0	6	1,127	14	5,385	108	25,969	87.1	85.6
Ga--------	380	31,507	100.0	100.0	26	2,845	7	562	417	35,682	96.8	96.4
Hawaii----	12	3,032	100.0	100.0	---	------	3	878	15	3,910	100.0	100.0
Idaho-----	509	25,312	98.3	98.2	32	1,505	19	553	528	25,865	98.3	98.2
Ill-------	1,311	57,483	100.0	100.0	139	6,290	244	8,382	1,666	70,070	90.6	92.5
Ind-------	968	39,409	100.0	100.0	166	6,474	75	2,480	1,043	41,889	81.6	80.5
Iowa------	1,686	62,113	100.0	100.0	213	7,910	1,176	32,550	2,862	94,663	96.5	97.3
Kans------	800	39,640	100.0	100.0	112	5,698	150	5,233	950	44,873	99.6	99.8
Ky--------	511	23,733	100.0	100.0	49	2,366	39	1,612	563	26,364	100.0	100.0
La--------	113	10,025	97.4	95.0	9	990	2	127	284	21,641	99.0	97.6
Maine-----	362	17,905	100.0	100.0	59	3,176	84	3,357	446	21,262	100.0	100.0
Md--------	641	41,040	100.0	100.0	94	7,127	74	3,292	715	44,332	100.0	100.0
Mass------	418	20,032	100.0	100.0	85	4,195	55	1,793	473	21,825	99.0	99.4
Mich------	1,571	79,632	100.0	100.0	151	9,621	1,281	46,969	2,852	126,601	100.0	100.0
Minn------	3,388	123,790	100.0	100.0	180	7,240	2,270	66,758	5,658	190,548	97.6	97.9
Miss------	282	22,907	100.0	100.0	23	1,818	6	511	293	23,814	96.7	97.7
Mo--------	548	29,323	100.0	100.0	80	4,590	207	7,716	755	37,039	100.0	100.0
Mont------	81	5,090	100.0	100.0	8	560	36	3,310	117	8,400	100.0	100.0
Nebr------	405	19,338	100.0	100.0	49	3,198	75	2,810	480	22,148	92.8	96.0
Nev-------	40	2,344	65.6	49.4	13	735	2	1,408	42	3,752	66.7	60.9
N. H------	217	10,313	100.0	100.0	50	2,546	57	2,078	284	12,961	100.0	100.0
N. J------	356	22,488	100.0	100.0	48	3,473	55	5,647	411	28,135	100.0	100.0
N. Mex----	28	6,790	100.0	100.0	9	2,683	1	82	29	6,872	90.6	78.1
N. Y------	3,562	188,007	100.0	100.0	324	17,621	2,222	86,880	5,784	274,887	98.0	98.2
N. C------	748	50,377	100.0	100.0	64	5,152	40	1,728	832	54,334	100.0	100.0
N. Dak----	150	5,811	99.3	92.7	15	605	23	630	188	6,846	97.9	90.6
Ohio------	2,012	88,729	100.0	100.0	375	17,867	458	14,426	2,470	103,155	75.3	80.9
Okla------	295	19,188	100.0	100.0	47	2,799	50	2,531	345	21,719	99.4	99.7
Oreg------	345	26,600	100.0	100.0	40	2,950	100	3,920	445	30,520	100.0	100.0
Pa--------	3,584	157,838	100.0	100.0	245	13,542	1,293	43,040	4,877	200,878	100.0	100.0
P. R------	7	1,007	100.0	100.0	---	------	-----	------	32	6,139	100.0	100.0
R. I------	41	1,908	100.0	100.0	19	689	-----	------	41	1,908	100.0	100.0
S. C------	275	29,261	100.0	100.0	45	5,898	3	152	283	29,566	100.0	100.0
S. Dak----	162	6,914	100.0	100.0	24	1,119	327	10,500	489	17,414	85.3	86.5
Tenn------	497	30,840	100.0	100.0	53	3,637	5	202	507	31,355	95.1	96.9
Tex-------	325	33,102	99.1	99.1	66	6,326	27	1,520	357	35,027	96.7	97.5
Utah------	401	22,318	100.0	100.0	26	1,455	25	1,031	426	23,349	100.0	100.0
Vt--------	710	38,335	100.0	100.0	113	6,199	229	9,263	940	47,648	72.2	73.3
Va--------	944	63,789	100.0	100.0	89	6,725	53	2,272	1,005	66,335	100.0	100.0
Wash------	633	42,714	100.0	100.0	90	6,410	39	1,531	672	44,245	100.0	100.0
W. Va-----	180	9,661	100.0	100.0	19	1,352	21	737	201	10,398	81.4	89.4
Wis-------	3,030	134,594	100.0	100.0	496	22,794	9,709	319,783	12,739	454,377	89.6	90.0
Wyo-------	38	1,443	100.0	100.0	5	220	24	1,015	62	2,458	100.0	100.0
Total or percent	34,211	1,858,390	96.1	86.9	4,013	245,587	20,806	713,922	55,471	2,603,209	91.4	86.0

1/ Includes WADAM testing: Alabama, 4 herds, 295 cows; Connecticut, 4 herds, 349 cows; Georgia, 30 herds, 3,613 cows; Illinois, 111 herds, 4,205 cows; Kentucky, 13 herds, 1,019 cows; Louisiana, 169 herds, 11,489 cows; Mississippi, 5 herds, 396 cows; New Hampshire, 10 herds, 570 cows; North Carolina, 44 herds, 2,229 cows; North Dakota, 15 herds, 405 cows; Puerto Rico, 25 herds, 5,132 cows; South Carolina, 5 herds, 153 cows; Tennessee, 5 herds, 313 cows; Texas, 5 herds, 405 cows; Vermont, 1 herd, 50 cows; Virginia, 8 herds, 274 cows. Total = 454 herds, 30,897 cows.

2/ Percent of Official DHI and DHIR **herds** or cows enrolled **in machine** processing.

TABLE 6.--Status of Dairy Herd Improvement Association work in the United States (1906-1969, inclusive)

Year	Associa-tions 1/	Super-visors 1/	Official DHI Plan							
						Average production				
			Herds	Cows	Cows per herd	Herds reported	Cows reported	Milk	Milk fat	Milk fat
	Number	Number	Number	Number	Number	Number	Number	Pounds	Percent	Pounds
1906---	1	-----	31	239	7.7	------	------	5,300	4.06	215
1907---	4	-----	------	1,606	----	------	------	5,366	4.10	220
1908---	6	-----	------	3,921	----	------	------	-----	----	---
1909---	25	-----	------	11,921	----	------	------	-----	----	---
1910---	40	-----	------	2/25,000	----	------	------	2/5,730	3.96	2/227
1911---	64	-----	------	2/40,000	----	------	------	-----	----	---
1912---	82	-----	------	2/43,000	----	------	------	-----	----	---
1913---	100	-----	------	47,150	----	------	------	-----	----	---
1914---	163	-----	------	73,280	----	------	------	-----	----	---
1915---	211	-----	------	105,526	----	------	------	-----	----	---
1916---	346	-----	------	150,677	----	------	------	-----	----	---
1917---	459	-----	11,720	216,831	18.5	------	------	-----	----	---
1918---	353	-----	9,778	172,518	17.6	------	------	-----	----	---
1919---	385	-----	10,000	167,313	16.7	------	------	-----	----	---
1920---	468	-----	11,948	203,472	17.0	------	------	6,175	4.00	247
1921---	452	-----	11,209	193,928	17.3	------	------	-----	----	---
1922---	513	-----	12,508	215,321	17.2	------	------	-----	----	---
1923---	627	-----	16,357	277,010	16.9	------	------	-----	----	---
1924 3/	---	-----	------	-------	----	------	------	-----	----	---
1925---	732	-----	18,677	307,073	16.4	------	42,302	7,189	3.95	284
1926---	777	-----	19,540	327,653	16.8	------	103,443	7,331	3.96	290
1927---	837	-----	21,128	362,014	17.1	------	116,509	7,411	3.95	293
1928---	947	-----	23,327	414,891	17.8	------	152,412	7,476	3.96	296
1929---	1,090	-----	26,182	465,804	17.8	------	194,859	7,498	3.97	298
1930---	1,143	-----	27,888	507,549	18.2	------	235,624	7,642	3.96	303
1931---	1,112	-----	26,308	510,714	19.4	------	219,924	7,812	3.92	306
1932---	1,005	-----	20,351	427,044	21.0	------	186,683	7,858	3.95	310
1933---	881	-----	15,447	358,501	23.2	------	163,014	7,849	3.99	313
1934---	793	-----	13,694	325,837	23.8	------	203,930	8,015	4.02	322
1935---	809	-----	15,573	364,218	23.4	------	200,367	7,977	4.04	322
1936---	876	-----	17,344	404,412	23.3	------	257,248	7,912	4.03	319
1937---	992	-----	20,772	496,562	23.9	------	354,568	7,923	4.04	320
1938---	1,106	-----	23,701	558,993	23.6	------	448,025	7,831	4.05	317
1939---	1,228	-----	25,949	625,284	24.1	------	507,563	7,977	4.05	323
1940---	1,300	-----	27,948	676,141	24.2	------	545,382	8,133	4.07	331
1941---	1,383	-----	31,381	763,502	24.3	------	591,103	8,225	4.07	335
1942---	1,421	-----	32,957	816,117	24.8	------	514,758	8,323	4.07	339
1943---	1,057	-----	24,155	616,972	25.5	------	375,914	8,325	4.06	338
1944---	954	-----	20,825	561,587	27.0	------	383,337	8,296	4.05	336
1945---	949	-----	21,254	577,200	27.2	------	384,360	8,592	4.03	346
1946---	1,124	-----	23,331	627,878	27.0	------	413,554	8,635	4.04	349
1947---	1,426	-----	28,812	775,546	26.9	------	533,061	8,638	4.03	348
1948---	1,668	-----	33,274	886,129	26.6	------	620,385	8,675	4.03	350
1949---	1,787	-----	35,851	943,939	26.3	------	729,150	8,907	4.03	359
1950---	1,973	-----	40,100	1,088,872	27.2	------	836,922	9,172	4.03	370
1951---	2,143	-----	42,949	1,186,615	27.6	------	885,859	9.195	4.02	370
1952---	2,109	-----	40,105	1,166,297	29.1	------	928,376	9,192	3.98	366
1953---	2,151	-----	40,983	1,226,588	29.9	------	1,020,326	9,253	3.98	368
1954---	2,175	-----	41,254	1,311,698	31.8	------	1,079,557	9.363	3.97	372
1955---	2,288	-----	41,240	1,333,866	32.3	------	1,175,378	9,502	3.95	375
1956---	2,266	-----	40,984	1,406,306	34.4	------	1,229,971	9,713	3.94	383
1957 4/	1,700	2,310	41,638	1,479,799	35.5	------	1,256,129	9,894	3.93	389
1958---	1,544	2,293	39,985	1,548,884	38.7	------	1,345,750	10,068	3.91	394
1959---	1,500	2,337	40,284	1,607,538	39.9	------	1,406,665	10,327	3.88	401
1960---	1,509	2,397	41,293	1,746,752	42.3	------	5/1,343,725	5/10,561	3.87	5/409
1961---	1,395	2,448	42,558	1,867,469	43.9	28,649	1,280,785	10,796	3.87	418
1962---	1,436	2,472	42,034	1,958,355	46.6	32,794	1,531,826	11,032	3.86	426
1963---	1,441	2,516	41,937	2,006,534	47.8	35,378	1,674,803	11,286	3.85	434
1964---	1,420	2,474	40,670	2,010,144	49.4	35,689	1,746,475	11,685	3.83	447
1965---	1,424	2,439	40,075	2,087,581	52.1	35,604	1,821,252	11,976	3.82	457
1966---	1,418	2,378	38,879	2,058,592	52.9	34,886	1,852,533	12,127	3.81	462
1967---	1,344	2,319	37,683	2,098,919	55.7	34,515	1,890,024	12,307	3.80	468
1968---	1,318	2,304	36,869	2,131,929	57.8	(6/)	(6/)	(6/)		(6/)
1969---	1,289	2,250	35,617	2,138,953	60.1	------	---------	------	----	---

1/ Number of associations and supervisors include all plans.
2/ Estimated.
3/ Date for collecting data changed in 1924 from July 1 to January 1.
4/ Prior to 1957 associations were counted on the basis of supervisor circuits.
5/ National testing year changed in 1960 to begin May 1. These values are averages of 1959 and 1961.
6/ Average production data were not available when this report was compiled.

TABLE 7.--Thirteen-year production summary: U.S. cows and Official DHI cows (1956-1968)

Year 1/	U.S. report for all milk cows					Official DHI Plan			
	Milk cows	Milk produced	Production/cow			Cows	Production/cow		
			Milk	Milk fat	Milk fat		Milk	Milk fat	Milk fat
	Thousands	Mil. lb.	Pounds	Percent	Pounds	Number	Pounds	Percent	Pounds
1956--------	20,501	124,860	6,090	3.83	233	1,479,799	9,713	3.94	383
1957--------	19,774	124,628	6,303	3.81	240	1,548,884	9,894	3.93	389
1958--------	18,711	123,220	6,585	3.78	249	1,607,538	10,068	3.91	394
1959--------	17,901	121,989	6,815	3.76	256	1,746,752	10,327	3.88	401
1960--------	17,515	123,109	7,029	3.76	264	1,867,469	2/10,561	3.87	2/409
1961--------	17,243	125,707	7,290	3.74	273	1,958,355	10,796	3.87	418
1962--------	16,842	126,251	7,496	3.74	280	2,006,534	11,032	3.86	426
1963--------	16,260	125,202	7,700	3.71	286	2,010,144	11,286	3.85	434
1964--------	15,677	126,967	8,099	3.70	300	2,087,581	11,685	3.83	447
1965--------	14,954	124,173	8,304	3.70	307	2,058,592	11,976	3.82	457
1966--------	14,093	119,892	8,507	3.69	314	2,098,919	12,127	3.81	462
1967--------	13,501	118,769	8,797	3.69	325	2,131,929	12,307	3.80	468
1968--------	3/13,022	3/117,281	3/9,006	3.68	3/331	2,138,953	(4/)	----	(4/)

1/ Based on succeeding January 1 reports of cows on test in the National Cooperative Dairy Herd Improvement Program.

2/ National testing year changed in 1960 to begin May 1. These values are averages of 1959 and 1961.

3/ Statistical Reporting Service (USDA), "Milk Production," January 1969. Data are preliminary.

4/ Average production data were not available when this report was compiled.

TABLE 8.--Thirteen-year summary of the National Cooperative Dairy Herd Improvement Program: U.S. cows and DHIA cows (1956-1968)

Year 1/	Official DHI Plan		Owner-Sampler Plan		Weigh-a-Day-a-Month Plan		Milk cows in U.S.	
	Cows on test	Proportion of U.S. cows	Cows on test	Proportion of U.S. cows	Cows on test	Proportion of U.S. cows	Cows 2/	Proportion of U.S. cows
	Number	Percent	Number	Percent	Number	Percent	Thousands	Percent
1956--------	1,479,799	7.22	405,090	1.98	21,297	0.10	20,501	9.3
1957--------	1,548,884	7.83	490,001	2.48	79,489	.40	19,774	10.7
1958--------	1,607,538	8.59	549,916	2.94	74,814	.40	18,711	11.9
1959--------	1,746,752	9.76	615,899	3.44	76,392	.43	17,901	13.6
1960--------	1,867,469	10.66	655,885	3.74	70,847	.40	17,515	14.8
1961--------	1,958,355	11.36	698,302	4.05	70,617	.41	17,243	15.8
1962--------	2,006,534	11.91	726,478	4.31	50,492	.30	16,842	16.5
1963--------	2,010,144	12.36	752,229	4.63	60,149	.37	16,260	17.4
1964--------	2,087,581	13.32	818,406	5.22	56,570	.36	15,677	18.9
1965--------	2,058,592	13.77	839,838	5.62	56,957	.38	14,954	19.8
1966--------	2,098,919	14.89	825,127	5.85	53,429	.38	14,093	21.1
1967--------	2,131,929	15.76	847,485	6.27	48,853	.36	13,501	22.4
1968--------	2,138,953	16.43	842,330	6.47	44,131	.34	13,022	23.2

1/ Based on succeeding January 1 reports of cows on test in the National Cooperative Dairy Herd Improvement program.

2/ Average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

TABLE 9.--Counties, by State, with 40 percent or more cows included in the National Cooperative Dairy Herd Improvement Program--January 1, 1969
(Numerals in parentheses at the end of county listing show the percentage of the States' counties that have 25 percent or more of their cows on test.)

State and county	Cows enrolled in DHIA plans
	Percent
ALABAMA	
Russell	70
Etowah	58
Elmore	57
Montgomery	48
Talladega	43
(15%)	
ALASKA	
(50%)	
ARIZONA	
Cochise	100
Pima	100
Pinal	100
Graham	80
Maricopa	40
(36%)	
ARKANSAS	
Miller	50
(3%)	
CALIFORNIA	
Alameda	100
Tehama	95
Ventura	84
Marin	81
Madera	76
Monterey	76
Contra Costa	73
Placer	66
San Joaquin	66
Yolo	65
Kern	63
San Luis Obispo	61
Fresno	60
San Diego	59
Santa Barbara	59
Napa	58
Stanislaus	57
Sonoma	55
Sacramento	54
San Benito	52
Santa Cruz	50
Kings	49
Merced	49
Sutter	49
Tulare	48
San Bernardino	43
Yuba	43
Colusa	40
Shasta	40
(67%)	
CONNECTICUT	
Tolland	63
Litchfield	55
Hartford	49
Windham	46
New Haven	40
New London	40
(100%)	
DELAWARE	
Sussex	48
(67%)	
FLORIDA	
St. Johns	93
Gilchrist	79
Seminole	78
FLORIDA (contd.)	
Citrus	72
Indian River	66
Jackson	63
Leon	62
Union	57
Orange	55
Jefferson	53
Sumter	50
Washington	44
Pinellas	41
Manatee	40
(30%)	
GEORGIA	
Douglas	95
Echols	95
Houston	83
Peach	80
Macon	79
Dooly	78
Mitchell	76
Jeff Davis	75
Newton	68
Clarke	66
Clayton	64
Burke	63
Coffee	63
Jefferson	63
Fayette	56
Walton	53
Stewart	50
Butts	48
Carroll	48
DeKalb	48
Lee	48
McDuffie	48
Rockdale	48
Tattnall	48
Dougherty	45
Thomas	45
Lamar	44
Brooks	42
Schley	42
Jones	40
(26%)	
HAWAII	
Maui	83
Hawaii	42
(60%)	
ILLINOIS	
Lawrence	62
Champaign	54
Monroe	53
Bond	44
(21%)	
INDIANA	
(12%)	
IOWA	
Dallas	59
Story	49
Webster	48
(24%)	
KANSAS	
Pawnee	67
Meade	65
Finney	63
KANSAS (contd.)	
Chase	53
Reno	51
Comanche	49
Harper	49
Seward	47
Saline	46
Harvey	42
(23%)	
LOUISIANA	
West Feliciana	68
Morehouse	56
Richland	50
West Carroll	44
(19%)	
MAINE	
Oxford	49
Androscoggin	40
(44%)	
MARYLAND	
Dorchester	45
(33%)	
MASSACHUSETTS	
Barnstable	76
Hampshire	42
(50%)	
MICHIGAN	
Kalamazoo	52
Barry	51
Missaukee	51
Jackson	49
Calhoun	48
Clinton	43
Hillsdale	43
Ingham	43
Lake	42
Shiawassee	41
(42%)	
MINNESOTA	
Ramsey	68
(16%)	
MONTANA	
(2%)	
NEBRASKA	
(6%)	
NEVADA	
Clark	88
Douglas	65
(24%)	
NEW HAMPSHIRE	
Sullivan	49
(80%)	
NEW JERSEY	
Burlington	63
Middlesex	63
Somerset	46
(38%)	
NEW MEXICO	
Dona Ana	64
Sierra	61

TABLE 9.--Counties, by State, with 40 percent or more cows included in the National Cooperative Dairy Herd Improvement Program--January 1, 1969--Continued

State and county	Cows enrolled in DHIA plans
	Percent
NEW MEXICO (contd.)	
Otero	45
(16%)	
NEW YORK	
Columbia	48
Dutchess	47
Long Island	46
Tompkins	46
Broome	40
(40%)	
NORTH CAROLINA	
Carteret	100
New Hanover	100
Scotland	100
Swain	100
Richmond	97
Hyde	88
Jones	75
Pitt	75
Caswell	69
Lenoir	69
Robeson	69
Beaufort	68
Columbus	68
Gaston	65
Wake	64
Johnston	61
Franklin	60
Warren	58
Brunswick	56
Bertie	55
Hoke	55
Nash	55
Macon	54
Bladen	53
Halifax	53
Guilford	52
Onslow	49
Orange	46
Randolph	46
Montgomery	45
Washington	45
Pender	44
Craven	43
Person	43
Durham	42
Granville	42
Cherokee	41
Cumberland	41
(59%)	
OHIO	
Marion	56
Erie	47
Hamilton	47
Wayne	42
Lorain	41
(48%)	
OREGON	
Benton	45
(31%)	
PENNSYLVANIA	
Montgomery	53
Blair	51
Lancaster	48
Sullivan	46
Huntingdon	41
Mifflin	41
Juniata	40
(63%)	
RHODE ISLAND	
(20%)	
SOUTH CAROLINA	
Colleton	79
Sumter	77
Kershaw	74
Bamberg	73
Jasper	71
Lee	66
Orangeburg	63
Hampton	62
Newberry	59
Marlboro	56
Saluda	56
Darlington	51
Calhoun	50
Greenville	46
Beaufort	45
Laurens	45
Barnwell	44
(48%)	
TEXAS	
Deaf Smith	75
Willacy	66
Burleson	65
Starr	65
El Paso	52
San Patricio	50
(7%)	
UTAH	
Salt Lake	56
Wasatch	54
Summit	46
Washington	44
Davis	43
(48%)	
VERMONT	
Bennington	46
Windsor	45
Washington	40
(79%)	
VIRGINIA	
James City	79
Lancaster	69
Henrico	59
City of Virginia Beach	56
Culpeper	53
Madison	52
Hanover	49
VIRGINIA (contd.)	
Gloucester	48
Chas.City & New Kent	47
Pulaski	47
Clarke	46
Orange	46
Powhatan	46
City of Chesapeake	44
Nansemond	44
Rockingham	43
Augusta	42
Charlotte	42
Spotsylvania	41
Brunswick	40
Fairfax	40
Loudoun	40
Roanoke	40
(44%)	
WASHINGTON	
Walla Walla	56
Klickitat	50
Wahkiakum	45
Kittitas	44
Asotin	42
(38%)	
WEST VIRGINIA	
(4%)	
WISCONSIN	
Kenosha	48
Winnebago	45
(42%)	

TABLE 10.--Lactation records received in 1968 1/

State	Official DHI cows on test 1-1-68	1968 production records				1967 production records	
		Punched (1095 cards)	Magnetic tape	Total	Proportion of cows enrolled in Official DHI	Total	Proportion of cows enrolled in Official DHI
	Number	Number	Number	Number	Percent 2/	Number	Percent 2/
Ala--------	32,105	1	25,732	25,733	80.2	30,116	97.7
Alaska-----	196	-----	170	170	86.7	208	126.1
Ariz-------	14,305	221	6,543	6,764	47.3	5,645	34.1
Ark--------	4,375	-----	4,080	4,080	93.3	4,467	117.6
Calif------	371,229	9,908	55,223	65,131	17.5	75,359	20.8
Colo-------	19,269	266	8,447	8,713	45.2	8,008	56.2
Conn-------	22,677	-----	32,122	32,122	141.7	23,460	103.4
Del--------	4,236	-----	6,145	6,145	145.1	4,407	98.8
Fla--------	21,078	-----	16,855	16,855	80.0	20,663	102.9
Ga---------	31,118	-----	27,149	27,149	87.2	35,357	113.6
Hawaii-----	4,322	-----	3,941	3,941	91.2	3,215	71.8
Idaho------	22,488	7	24,708	24,715	109.9	27,270	88.8
Ill--------	58,034	29,729	41,311	71,040	122.4	60,275	98.2
Ind--------	43,759	5	42,051	42,056	96.1	47,198	109.4
Iowa-------	60,756	-----	58,356	58,356	96.0	69,363	116.6
Kans-------	38,162	-----	37,493	37,493	98.2	42,208	119.5
Ky---------	23,497	6	19,425	19,431	82.7	23,036	104.5
La---------	8,356	-----	6,534	6,534	78.2	6,828	91.2
Maine------	18,782	-----	26,670	26,670	142.0	18,866	105.7
Md---------	41,714	4,874	33,488	38,362	92.0	42,913	107.0
Mass-------	20,030	-----	28,114	28,114	140.4	21,441	101.3
Mich-------	78,058	17	66,902	66,919	85.7	80,196	98.6
Minn-------	119,023	1	120,900	120,901	101.6	130,027	106.4
Miss-------	21,888	8	17,702	17,710	80.9	18,623	99.6
Mo---------	26,212	-----	25,508	25,508	97.3	26,838	111.8
Mont-------	4,316	62	1,943	2,005	46.5	2,487	73.6
Nebr-------	18,796	-----	17,943	17,943	95.5	18,529	111.0
Nev--------	6,380	61	1,674	1,735	27.2	1,744	27.1
N. H-------	13,014	-----	18,336	18,336	140.9	13,006	105.5
N. J-------	23,992	-----	34,273	34,273	142.9	25,315	100.3
N. Mex-----	6,916	143	6,200	6,343	91.7	5,810	93.0
N. Y-------	186,511	-----	276,640	276,640	148.3	186,679	102.7
N. C-------	49,901	10	43,780	43,790	87.8	50,296	105.5
N. Dak-----	5,902	-----	5,033	5,033	85.3	6,074	99.6
Ohio-------	90,978	8	88,827	88,835	97.6	96,775	106.5
Okla-------	17,010	-----	16,786	16,786	98.7	16,363	115.5
Oreg-------	24,195	-----	25,731	25,731	106.3	24,048	91.4
Pa---------	178,203	9	203,099	203,108	114.0	167,820	93.4
P. R-------	820	-----	------	------	----	------	----
R. I-------	2,230	-----	2,928	2,928	131.3	2,115	96.5
S. C-------	26,391	1	22,200	22,201	84.1	24,637	99.0
S. Dak-----	5,604	-----	5,985	5,985	106.8	6,991	105.1
Tenn-------	31,011	7	26,346	26,353	85.0	31,495	103.5
Tex--------	32,476	11	27,445	27,456	84.5	29,829	102.7
Utah-------	21,107	527	18,475	19,002	90.0	18,704	92.1
Vt---------	39,121	-----	58,010	58,010	148.3	38,751	99.2
Va---------	62,956	4	55,803	55,807	88.6	63,535	107.6
Wash-------	37,248	-----	44,209	44,209	118.7	43,275	116.8
W. Va------	8,367	-----	12,241	12,241	146.3	8,500	96.7
Wis--------	131,243	4	121,244	121,248	92.4	142,274	112.6
Wyo--------	1,572	1	220	221	14.1	235	16.5
U.S.-------	2,131,929	45,891	1,870,940	3/ 1,916,831	89.9	1,851,274	88.2

1/ Lactation record input for May and September 1968, and January 1969 production runs.

2/ Percentages vary by State and may exceed 100 percent depending upon reporting and processing procedures in December and January of each year and year to year changes in reporting procedures.

3/ Does not include approximately 165,000 lactation records that were resubmitted from the Utah and Pennsylvania computing centers.

TABLE 11.--Eleven-year summary: Lactation records received by USDA

Year	Official DHI cows enrolled on January 1 of each year	Lactation records reported to USDA	Official DHI cows represented by records reported
	Number	Number	Percent
1958-----	1,548,884	786,496	51
1959-----	1,607,538	927,998	58
1960-----	1,746,752	886,495	51
1961-----	1,867,469	1,084,799	58
1962-----	1,958,355	1,211,407	62
1963-----	2,006,534	1,320,423	66
1964-----	2,010,144	1,437,959	72
1965-----	2,087,581	1,749,752	84
1966-----	2,058,592	1,788,974	87
1967-----	2,098,919	1,851,274	88
1968-----	2,131,929	1,916,831	90

TABLE 12.--Relative frequency of error conditions in lactation records rejected in preliminary edits in 1968 1/

Error conditions	Total error conditions 2/	Percent of all error conditions 2/
Registered cows		
Zero dam number	3,428	20.45
Zero sire number	3,120	18.61
Cow and dam breed unequal	1,868	11.14
Cow and sire breed unequal	1,584	9.45
"Eight" cow breed	1,076	6.42
Alpha sire number	316	1.88
Zero cow number	306	1.83
Alpha dam number	216	1.29
Alpha cow number	177	1.06
Eartag sire number	145	0.86
Zero cow breed	91	.54
Blank cow breed	7	.04
Grade cows		
"Non eight" eartag cow breed, unequal sire breed	484	2.89
Eartag cow breed "eight", "non eight" sire and dam equal	140	.84
Registered or grade cows		
Zero sire breed	2,020	12.05
Zero dam breed	648	3.87
Zero days in milk	510	3.04
Blanks in any position of record	462	2.76
Alpha in hi-order 2 positions of cow number	83	.50
Alpha in hi-order 2 positions of dam number	47	.28
Alpha in hi-order 2 positions of sire number	34	.20
Alpha "J" through "Z" in "Termination" code	2	.01
Total	16,764	100.00

1/ Total lactation records in error = 10,562. Proportion of error conditions in the 1,916,831 lactation records processed is 0.87 percent.

2/ Relative frequency of error conditions may be somewhat inflated due to the fact that both the Utah and Pennsylvania computing centers resubmitted approximately 165,000 lactation records during the year.

TABLE 13.--Relative frequency of Official DHI lactation record rejects in 1968, by reason for rejection

Reject code	Type of error	Total error conditions 1/	Percent of all rejects 1/	Percent of all records entered 1/ 2/
F	Conflicting or questionable calving date	16,993	18.4	0.9
B	Conflicting or questionable birth date	15,822	17.1	.8
A	Conflict with previous information supplied	14,973	16.2	.8
C	Conflicting or questionable cow number	9,627	10.4	.5
D	Conflicting or questionable dam number	9,559	10.3	.5
S	Conflicting or questionable sire number	7,013	7.6	.4
J	Equal identification number for two or more of the animals in the pedigree	575	0.6	(3/)
I	Invalid characters - usually blanks or alphabetics	360	.4	(3/)
G	Invalid State code	319	.3	(3/)
E	Conflicting or questionable breed code	122	.1	(3/)
M	Conflicting or questionable milk, pounds	94	.1	(3/)
P	Conflicting or questionable percent fat	84	.1	(3/)
Q	Conflicting or questionable fat, pounds	60	.1	(3/)
N	Conflicting or questionable days in milk	8	(3/)	(3/)
L	Days milked 3X exceed days in milk	4	(3/)	(3/)
Pre-edit rejects 4/		16,764	18.1	.9
Total		5/92,377	100.0	4.8

1/ Relative frequency of error conditions may be somewhat inflated due to the fact that both the Utah and Pennsylvania computing centers resubmitted approximately 165,000 lactation records during the year.

2/ The incoming lactation records = 1,916,831.

3/ Less than 0.05 percent.

4/ For breakdown of pre-edit rejects see table 12.

5/ A total of 73,959 records were rejected, but the higher number of error conditions indicate some records contained more than one wrong, questionable, or conflicting data item.

TABLE 14.--Rank of States in percentage of cows included in the program: Official DHI-OS-WADAM

State	Rank	State	Rank
	Percent		Percent
California	47.4	Rhode Island	23.6
Nevada	44.9	Alabama	23.2
South Carolina	41.1	New Mexico	23.2
Arizona	40.3	Illinois	23.0
Connecticut	39.8	Kansas	21.2
New Jersey	35.6	Indiana	20.7
New Hampshire	33.2	Colorado	19.7
Delaware	32.7	Minnesota	18.4
Massachusetts	31.8	Montana	18.3
Utah	31.1	West Virginia	17.4
Vermont	31.1	Iowa	17.1
Maine	30.8	Idaho	16.9
Hawaii	29.0	Florida	16.7
Alaska	28.8	Oklahoma	14.1
Virginia	28.7	Wyoming	12.6
North Carolina	28.2	Louisiana	12.3
Pennsylvania	27.6	Mississippi	11.7
Oregon	27.0	Nebraska	11.0
New York	26.9	South Dakota	10.0
Ohio	26.9	Tennessee	9.8
Michigan	26.8	Texas	9.8
Wisconsin	26.7	Missouri	9.7
Georgia	26.6	Arkansas	9.2
Maryland	26.1	Kentucky	7.2
Washington	23.8	North Dakota	4.8
		U.S	23.2

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Dairy-Herd-Improvement Letter ARS-44-213
(Vol. 45, No. 2)

May 1969

ARTIFICIAL INSEMINATION (AI) PARTICIPATION REPORT FOR THE UNITED STATES 1969 1/

A total of 7,933,878 cows were bred artificially in the United States in 1968. Of these, 7,138,636 were dairy cows and 795,242 were beef cows. This represented an increase of 90,278 dairy cows and 122,423 beef cows from the previous year. Also, for the first time over one-half of the Nation's dairy cows and heifers were bred artificially.

Semen from dairy bulls was used to inseminate 6,423,786 dairy cows. Semen from beef bulls was used to inseminate 1,510,092 beef and dairy cows.

It is likely that the total number of artificial inseminations to dairy and beef cows reported is below the true number of AI services. This occurred mainly because it was not possible to obtain reports from two organizations. Also, information on custom freezing by organizations and individuals that are not members of the National Association of Animal Breeders was not available.

1/ Prepared by B. T. McDaniel, F. N. Dickinson, C. A. Rampendahl, and J. J. Corbin from data supplied by artificial insemination organizations, State Extension Dairymen, and the National Association of Animal Breeders.

Issued August 1969

Because of incomplete reporting and the lack of information, the tabular data in this report are partly estimations. Where possible, estimates were based on the averages and percentages from complete reports. When only the number of ampules of semen used were available, the number of first services was estimated to be one-half of the number of ampules reported.

Table 1 shows that 50.5 percent of the Nation's 14,123,000 dairy cows and heifers were artificially inseminated in 1968. Approximately 12.5 percent, or 892,609, of the dairy cattle so bred were registered. The number of dairy animals bred to beef bulls dropped for the fifth consecutive year. About 2.2 percent of the Nation's beef cows and heifers were artificially inseminated in 1968.

The top 10 States in number and percentage of dairy and beef cows bred artificially are shown in table 2. Wisconsin had the highest number of dairy cows inseminated, and Montana the highest number of beef cows.

The scope of artificial insemination by State for the years 1967 and 1968 is shown in table 3. The greatest increase in the number of dairy cows bred occurred in California, and Ohio had the greatest advance in beef cows.

The number of cows bred artificially in the United States since 1939 is shown by year in table 4. The continual upward trend in the percentage of dairy cattle bred artificially is illustrated in figure 1. The trend in beef cattle since reporting was commenced in 1963 is shown in figure 2.

Table 5 shows that 30 organizations bred cows artificially in 1968. These organizations serviced an estimated 407,375 herds. However, it should be noted that a herd was counted more than once when two or more AI studs bred cows in the same herd. In addition to the 7,489,889 cattle serviced directly, it is estimated that 413,401 cows were bred by semen sold to individual farmers by the studs, and that 30,588 cows were bred by semen custom-frozen.

TABLE 1.--Status of artificial breeding in the United States, January 1, 1969

State and other sources	Studs 1/	Bred to dairy sires in 1968		Bred to beef sires in 1968		Dairy cattle		Beef cattle	
		Registered dairy cows 2/	Total dairy cows	Dairy cows	Beef cows	All U.S. milk cows 3/	Dairy cows bred as a percentage of all milk cows 4/	Other U.S. cattle and calves 2 years and older 5/	Beef cows bred as a percentage of other cattle and calves 6/
	Number	Number	Number	Number	Number	Thousands	Percent	Thousands	Percent
Alabama--------	0	4,827	36,901	6,100	6,263	156	27.6	903	0.7
Alaska---------	1	60	999	15	46	1.9	53.4	2.5	1.8
Arizona--------	0	2,275	15,876	1,830	1,415	55	32.2	367	.4
Arkansas-------	0	2,751	22,949	4,964	6,255	109	25.6	879	.7
California-----	2	42,215	441,128	20,517	20,097	848	54.4	993	2.0
Colorado-------	1	3,337	36,644	2,496	11,305	110	35.6	995	1.1
Connecticut----	0	10,724	45,593	7,193	968	73	72.3	4	24.2
Delaware-------	0	2,532	7,804	1,297	85	16	56.9	5	1.7
Florida--------	0	13,852	134,632	19,065	18,295	189	81.3	893	2.0
Georgia--------	0	18,445	51,285	6,740	6,279	152	38.2	811	.8
Hawaii---------	0	1,587	11,100	------	974	15	74.0	92	1.1
Idaho----------	0	6,668	81,465	6,822	11,706	171	51.6	564	2.1
Illinois-------	1	27,735	162,720	21,669	19,464	363	50.8	795	2.4
Indiana--------	0	15,674	98,164	12,243	15,164	274	40.3	406	3.7
Iowa-----------	0	18,448	201,096	33,244	17,800	605	38.7	1,405	1.3
Kansas---------	1	8,974	77,813	6,722	43,900	225	37.6	1,710	2.6
Kentucky-------	0	12,493	103,036	16,470	17,375	400	29.9	1,005	1.7
Louisiana------	1	9,656	62,803	9,263	16,438	198	36.4	901	1.8
Maine----------	0	8,184	42,418	3,666	448	76	60.6	9	5.0
Maryland-------	1	11,832	75,755	8,583	3,484	184	45.8	54	6.5
Massachusetts--	0	9,550	38,645	5,162	630	75	58.4	4	15.8
Michigan-------	2	39,114	253,375	28,907	8,735	499	56.6	123	7.1
Minnesota------	1	35,145	526,823	68,292	19,017	1,146	51.9	530	3.6
Mississippi----	1	5,424	47,155	2,772	6,578	233	21.4	1,235	.5
Missouri-------	0	14,961	115,580	10,507	30,311	412	30.6	1,785	1.7
Montana--------	0	1,452	11,950	976	63,317	48	26.9	1,556	4.1
Nebraska-------	0	5,230	45,259	7,445	21,979	218	24.2	1,882	1.2
Nevada---------	0	725	6,735	120	2,608	15	45.7	311	.8
New Hampshire--	0	5,043	21,896	2,628	279	43	57.0	2	14.0
New Jersey-----	0	11,982	45,991	5,896	397	82	63.3	8	5.0
New Mexico-----	0	2,355	24,739	146	2,255	39	63.8	690	.3
New York-------	1	127,452	655,571	65,830	4,310	1,132	63.7	57	7.6
North Carolina-	1	15,018	81,561	11,156	7,053	211	43.9	333	2.1
North Dakota---	0	1,640	25,614	1,737	20,003	168	16.3	948	2.1
Ohio-----------	2	50,532	257,981	37,763	36,936	503	58.8	325	11.4
Oklahoma-------	0	3,376	26,858	3,612	10,624	166	18.4	2,070	.5
Oregon---------	0	5,645	64,311	6,155	12,288	120	58.7	675	1.8
Pennsylvania---	2	138,082	484,605	66,463	10,413	815	67.6	101	10.3
Puerto Rico----	1	11,043	70,402	2	398	-----	----	-----	----
Rhode Island---	0	1,063	4,551	551	98	8	63.8	1	9.8
South Carolina-	0	4,622	29,686	5,776	2,955	76	46.7	256	1.2
South Dakota---	0	2,550	29,648	3,544	24,738	214	15.5	1,686	1.5
Tennessee------	3	8,536	76,138	15,211	12,344	352	26.0	922	1.3
Texas----------	0	6,265	96,467	2,932	40,575	374	26.6	5,517	.7
Utah-----------	1	4,767	53,027	3,803	4,379	82	69.3	329	1.3
Vermont--------	0	22,594	128,406	12,290	1,544	232	60.6	4	38.6
Virginia-------	1	12,825	105,965	14,041	4,618	253	47.4	484	1.0
Washington-----	2	11,932	135,615	11,256	15,453	200	73.4	370	4.2
West Virginia--	0	2,459	18,734	4,945	2,708	72	32.9	196	1.4
Wisconsin------	4	108,521	1,208,392	125,627	25,980	2,094	63.7	226	11.5
Wyoming--------	0	437	4,829	406	11,628	20	26.2	677	1.7
Reported AI activity, but State unknown 7/	-	-------	17,096	-------	3,237	-----	----	-----	----
Armour & Co. 8/	-	-------	-------	-------	6,600	-----	----	-----	----
International Beef Breeders 8/	-	-------	-------	-------	45,690	-----	----	-----	----
Semen services reported from ranchers' bulls 8/------	-	-------	-------	-------	116,803	-----	----	-----	----
United States--	30	892,609	6,423,786	714,850	795,242	14,123	50.5	36,097	2.2

1/ States without studs purchase semen from studs in other States. See table 7 for names and addresses of studs.

2/ Data for registered cows may have been all or partially estimated when incomplete report was given.

3/ Preliminary figures for number of cows and heifers 2 years old and over kept for milk; estimated by the Statistical Reporting Service (USDA).

4/ Percentage of all dairy cows bred included in the artificial insemination program.

5/ Preliminary figures for other cattle and calves 2 years and older; estimated by the Statistical Reporting Service (USDA).

6/ Percentage of all beef cows bred included in the artificial insemination program.

7/ AI breeding activity reported for: Curtiss, 4,000 cows; Midwest Breeders, 503 cows; Select Sires, 15,830 cows. Total: 20,333 cows. Data were received from studs.

8/ Information obtained from National Association of Animal Breeders, P.O. Box 1033, Columbia, Missouri 65201.

TABLE 2.--States with the highest number and percentage of dairy and beef cows bred artificially in 1968

Rank	State	Cows bred artificially	Rank	State	Cows bred artificially
		Number			Percent
		DAIRY COWS			
1	Wisconsin	1,334,019	1	Florida	81.3
2	New York	721,401	2	Hawaii	74.0
3	Minnesota	595,115	3	Washington	73.4
4	Pennsylvania	551,068	4	Connecticut	72.3
5	California	461,645	5	Utah	69.3
6	Ohio	295,744	6	Pennsylvania	67.6
7	Michigan	282,282	7	New Mexico	63.8
8	Iowa	234,340	8	Rhode Island	63.8
9	Illinois	184,389	9	New York	63.7
10	Florida	153,697	10	Wisconsin	63.7
		BEEF COWS			
1	Montana	63,317	1	Vermont	38.6
2	Kansas	43,900	2	Connecticut	24.2
3	Texas	40,575	3	Massachusetts	15.8
4	Ohio	36,936	4	New Hampshire	14.0
5	Missouri	30,311	5	Wisconsin	11.5
6	Wisconsin	25,980	6	Ohio	11.4
7	South Dakota	24,738	7	Pennsylvania	10.3
8	Nebraska	21,979	8	Rhode Island	9.8
9	California	20,097	9	New York	7.6
10	North Dakota	20,003	10	Michigan	7.1

TABLE 3.--Comparison of artificial breeding in the United States for years 1967 and 1968

State and other sources	Dairy cows bred artificially				Beef cows bred artificially			
	In 1967	In 1968	Increase or decrease	Increase or decrease 1/	In 1967	In 1968	Increase or decrease	Increase or decrease 2/
	Number	Number	Number	Percent	Number	Number	Number	Percent
Alabama----------	45,252	43,001	-2,251	+0.3	3,650	6,263	+2,613	+0.3
Alaska-----------	1,189	1,014	-175	-6.1	9	46	+37	+1.4
Arizona----------	10,227	17,706	+7,479	+13.6	5,033	1,415	-3,618	-.9
Arkansas---------	23,417	27,913	+4,496	+5.1	4,264	6,255	+1,991	+.2
California-------	391,970	461,645	+69,675	+8.7	19,014	20,097	+1,083	+.1
Colorado---------	35,106	39,140	+4,034	+2.5	7,264	11,305	+4,041	+.4
Connecticut------	50,398	52,786	+2,388	+6.8	140	968	+828	+20.7
Delaware---------	9,052	9,101	+49	+3.7	94	85	-9	-.7
Florida----------	165,360	153,697	-11,663	-6.2	15,294	18,295	+3,001	+.2
Georgia----------	61,663	58,025	-3,638	-1.6	5,862	6,279	+417	+.1
Hawaii-----------	10,647	11,100	+453	+7.5	1,480	974	-506	-.6
Idaho------------	64,022	88,287	+24,265	+13.0	9,353	11,706	+2,353	+.3
Illinois---------	190,129	184,389	-5,740	+1.5	17,576	19,464	+1,888	+.2
Indiana----------	110,530	110,407	-123	+1.5	12,870	15,164	+2,294	+.7
Iowa-------------	229,305	234,340	+5,035	+3.4	23,002	17,800	-5,202	-.4
Kansas-----------	90,936	84,535	-6,401	-.3	37,493	43,900	+6,407	+.4
Kentucky---------	122,344	119,506	-2,838	+.8	14,658	17,375	+2,717	+.2
Louisiana--------	72,338	72,066	-272	+1.3	8,465	16,438	+7,973	+.8
Maine------------	50,516	46,084	-4,432	-3.3	94	448	+354	+4.1
Maryland---------	84,640	84,338	-302	+.3	2,521	3,484	+963	+1.8
Massachusetts----	46,803	43,807	-2,996	-.1	232	630	+398	+10.0
Michigan---------	295,272	282,282	-12,990	-.3	6,361	8,735	+2,374	+1.6
Minnesota--------	611,829	595,115	-16,714	+.1	15,362	19,017	+3,655	+.6
Mississippi------	56,450	49,927	-6,523	-1.6	8,138	6,578	-1,560	-.2
Missouri---------	130,989	126,087	-4,902	+.1	19,907	30,311	+10,404	+.6
Montana----------	11,472	12,926	+1,454	+4.4	53,435	63,317	+9,882	+.6
Nebraska---------	45,446	52,704	+7,258	+4.9	22,386	21,979	-407	+.1
Nevada-----------	5,076	6,855	+1,779	+11.9	2,109	2,608	+499	+.1
New Hampshire----	25,510	24,524	-986	+.3	155	279	+124	+6.2
New Jersey-------	57,315	51,887	-5,428	-.4	350	397	+47	0
New Mexico-------	26,308	24,885	-1,423	-2.0	891	2,255	+1,364	+.2
New York---------	727,478	721,401	-6,077	-1.6	2,895	4,310	+1,415	+2.2
North Carolina---	93,038	92,717	-321	+.4	7,571	7,053	-518	-.3
North Dakota-----	19,781	27,351	+7,570	+5.5	19,999	20,003	+4	0
Ohio-------------	296,033	295,744	-289	+3.5	17,916	36,936	+19,020	+6.0
Oklahoma---------	20,194	30,470	+10,276	+6.6	12,137	10,624	-1,513	-.1
Oregon-----------	65,553	70,466	+4,913	+6.7	10,637	12,288	+1,651	+.2
Pennsylvania-----	535,335	551,068	+15,733	+2.6	10,120	10,413	+293	0
Puerto Rico------	59,607	70,404	+10,797	----	200	398	+198	----
Rhode Island-----	4,791	5,102	+311	+15.9	54	98	+44	+4.4
South Carolina---	35,594	35,462	-132	+3.4	4,586	2,955	-1,631	-.7
South Dakota-----	33,882	33,192	-690	+.4	16,135	24,738	+8,603	+.5
Tennessee--------	102,460	91,349	-11,111	-1.3	8,832	12,344	+3,512	+.3
Texas------------	98,481	99,399	+918	+2.3	36,437	40,575	+4,138	0
Utah-------------	52,398	56,830	+4,432	+4.6	4,549	4,379	-170	-.1
Vermont----------	128,136	140,696	+12,560	+6.3	398	1,544	+1,146	+28.6
Virginia---------	115,569	120,006	+4,437	+3.6	4,800	4,618	-182	0
Washington-------	122,915	146,871	+23,956	+14.9	16,928	15,453	-1,475	-.2
West Virginia----	24,288	23,679	-609	+1.4	2,531	2,708	+177	0
Wisconsin--------	1,371,272	1,334,019	-37,253	-.2	20,799	25,980	+5,181	+1.5
Wyoming----------	5,842	5,235	-607	-.4	9,883	11,628	+1,745	+.3
Reported AI activity, but State unknown 3/	4,200	17,096	+12,896	----	16,329	3,237	-13,092	----
Armour & Co. 3/	-------	-------	-------	----	4/23,658	6,600	-17,058	----
International Beef Breeders 3/	-------	-------	-------	----	48,335	45,690	-2,645	----
Semen services reported from ranchers' bulls 3/	-------	-------	-------	----	59,628	116,803	+57,175	----
United States----	7,048,358	7,138,636	+90,278	+2.4	4/672,819	795,242	+122,423	+.3

1/ Derived from all dairy cows bred in the artificial insemination program as a percentage of all milk cows in the United States.

2/ Derived from all beef cows bred in the artificial insemination program as a percentage of other cattle and calves 2 years and older in the United States.

3/ For year 1968 see table 1 and footnotes. For year 1967, see table 1 and footnotes in the May 1968 Dairy-Herd-Improvement Letter covering the Artificial Insemination Participation Report for 1967.

4/ Additional or revised data. See Errata and table 7 in the November 1968 Dairy-Herd-Improvement Letter for details.

TABLE 4.--Status of artificial breeding program in the United States, 1939-1969 inclusive

Year	Studs	Sires in service				Herds1/	Dairy cows bred to-		Beef cows bred to beef bulls	Total cattle bred	Cows bred per sire
		Dairy	Beef	Total	Average per stud		Dairy bulls	Beef bulls			
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
1939	7	--	--	33	4.7	646	--	--	--	7,359	228
1940	25	--	--	138	5.5	2,971	--	--	--	33,977	246
1941	35	--	--	237	6.8	5,997	--	--	--	70,751	299
1942	46	--	--	412	9.0	12,118	--	--	--	112,788	274
1943	59	--	--	574	9.7	23,448	--	--	--	182,524	318
1944	56	--	--	657	11.7	28,627	--	--	--	218,070	332
1945	67	--	--	729	10.9	43,998	--	--	--	360,732	495
1946	78	--	--	900	11.5	73,293	--	--	--	537,376	597
1947	84	--	--	1,453	17.3	140,571	--	--	--	1,184,168	815
1948	91	--	--	1,745	19.2	224,493	--	--	--	1,713,581	982
1949	90	--	--	1,940	21.6	316,177	--	--	--	2,091,175	1,078
1950	97	--	--	2,104	21.7	409,300	--	--	--	2,619,555	1,245
1951	94	--	--	2,187	23.3	548,300	--	--	--	3,509,573	1,605
1952	94	--	--	2,324	24.7	671,100	--	--	--	4,295,243	1,848
1953	96	--	--	2,598	27.1	755,000	--	--	--	4,845,222	1,865
1954	93	--	--	2,661	28.6	805,000	--	--	--	5,155,240	1,937
1955	79	--	--	2,450	31.0	845,900	--	--	--	5,413,874	2,210
1956	79	--	--	2,553	32.3	900,400	--	--	--	5,762,656	2,257
1957	75	--	--	2,651	35.3	946,000	--	--	--	6,055,982	2,284
1958	71	--	--	2,676	37.7	975,372	--	--	--	6,645,568	2,483
1959	64	--	--	2,460	38.4	930,059	--	--	--	6,932,294	2,816
1960	62	--	--	2,544	41.0	910,000	--	--	--	7,144,679	2,808
1961	56	--	--	2,486	44.4	863,781	7,047,148	2/435,492	--	7,482,740	3,010
1962	56	2,036	420	2,456	43.9	862,150	6,837,681	2/911,006	--	7,748,687	3,155
1963	51	2,158	401	2,559	50.2	621,141	6,468,545	969,748	235,289	7,673,582	2,999
1964	50	2,140	398	2,538	50.8	654,311	6,165,599	1,117,395	464,959	7,747,953	3,053
1965	3/46	1,867	449	2,316	50.3	591,859	6,301,178	963,657	615,147	7,879,982	3,402
1966	3/44	1,949	439	2,388	54.3	540,265	6,413,453	873,127	4/695,181	4/7,981,761	4/3,342
1967	35	2,012	364	2,376	67.9	458,782	6,259,425	788,933	4/672,819	5/4/7,871,265	4/3,313
1968	3/33	2,028	352	2,380	72.1	407,375	6,423,786	714,850	795,242	6/7,933,878	3,334
1969	3/30	1,955	390	2,345	78.2	--	--	--	--	--	--

1/ Prior to 1963, number of herds largely reflected membership rather than those actually serviced.
2/ Probably includes some beef to beef inseminations.
3/ Includes one all-beef stud.
4/ Data are revised. See Errata and table 7 in the November 1968 Dairy-Herd-Improvement Letter for details.
5/ Total cattle bred in 1967 includes 150,088 first services, by State only, where breakdowns were not reported.
6/ Not shown are inseminations to 9,612 swine and 442 goats.

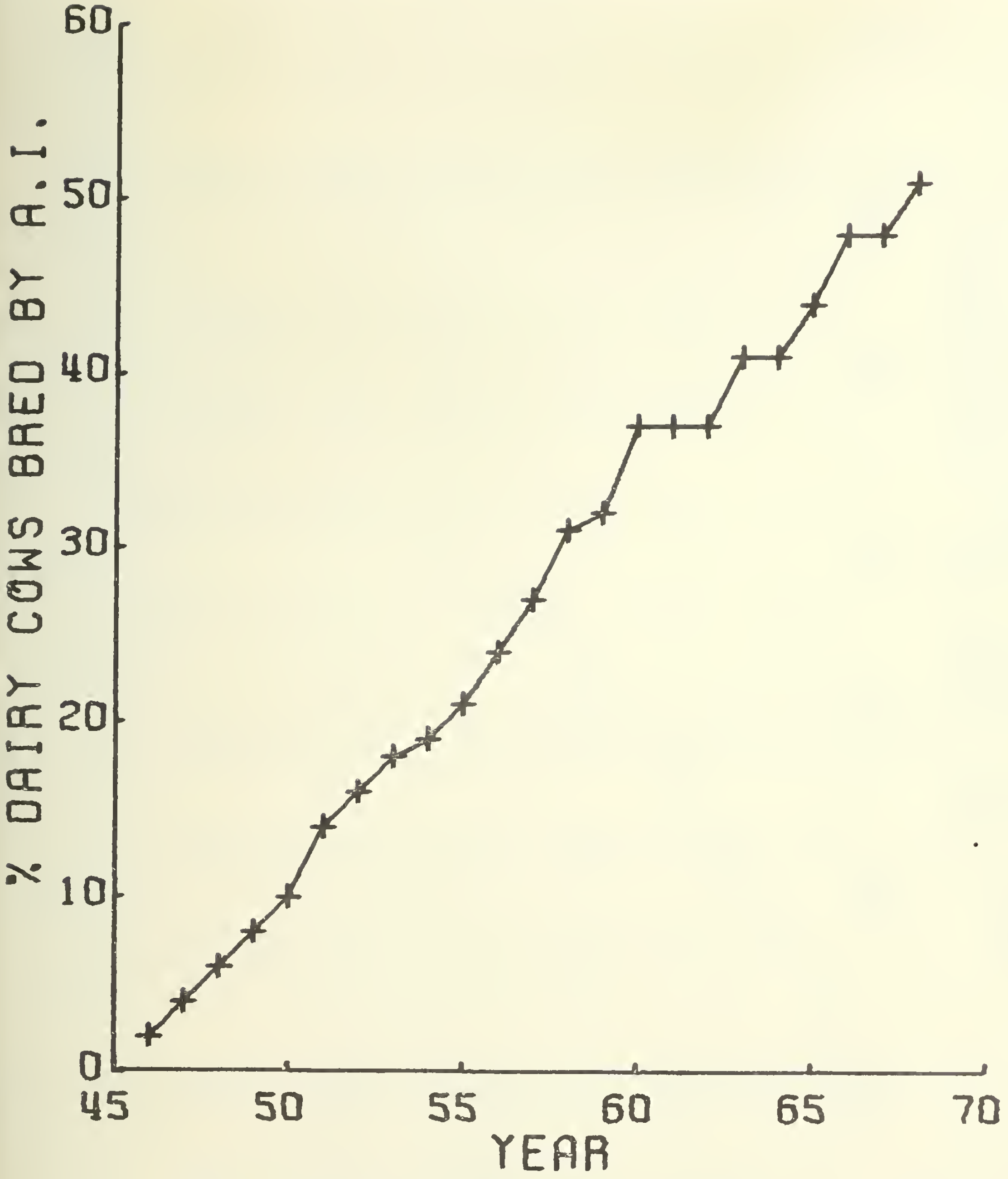

FIGURE 1.--Yearly trends in the percentage of U.S. dairy cows bred artificially since 1946.

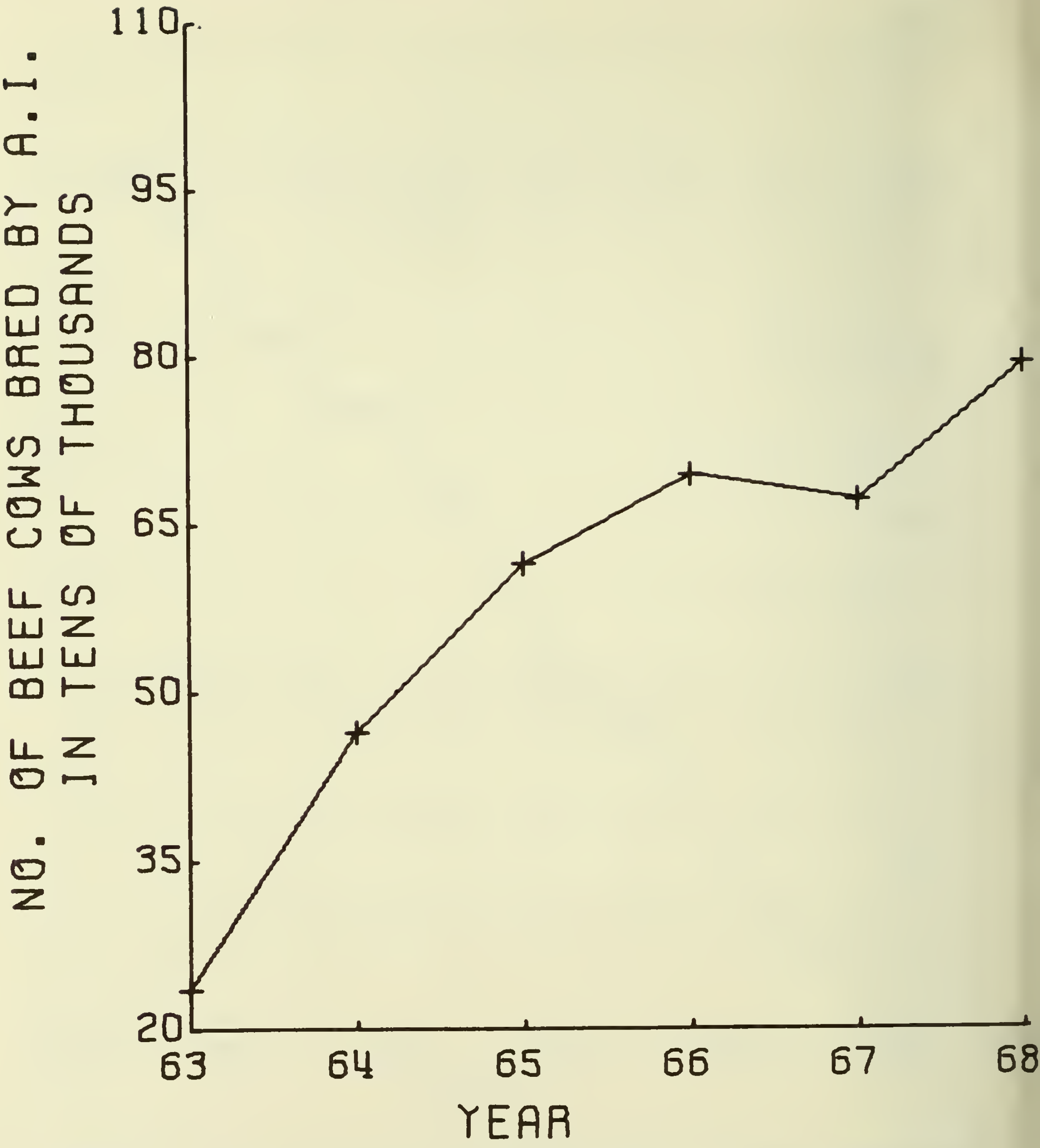

FIGURE 2.--Yearly trends in the number of U.S. beef cows bred artificially since 1963.

TABLE 5.--Cows bred in artificial-breeding organization bull studs during 1968

			Cows bred in 1968										
			First services				Semen sales and custom-freezing		Total breedings of--		Estimated total number of cows bred	Inseminations of--	
Stud code	Name of stud[1]	Herds serviced	Dairy total	Dairy to beef	Beef to beef	Total first services	Dairy to dairy	Beef to beef	Dairy cows	Beef cows		Swine	Goats
		Number											
2110	Eastern AIC-------	33,951	659,529	69,085	3,112	731,726	4,012	------	732,626	3,112	735,738	-----	---
2309	Atlantic----------	13,251	190,882	25,835	5,815	222,532	200	40	216,917	5,855	222,772	-----	---
2311	NEBA--------------	2/9,355	154,606	21,980	1,165	177,751	2,394	------	178,980	1,165	180,145	-----	17
3102	NOBA--------------	10,477	213,185	39,167	10,315	262,667	11,854	16,303	264,206	26,618	290,824	-----	---
3303	Curtiss-----------	37,850	960,876	115,812	71,529	1,148,217	4,000	------	1,080,688	71,529	1,152,217	-----	408
3401	Michigan ABC------	13,140	167,765	19,896	4,127	191,788	1,355	------	189,016	4,127	193,143	-----	---
3407	General Genetics--	800	22,900	1,337	200	24,437	3,243	508	27,480	708	28,188	-----	---
3503	East Central------	4,500	76,166	13,226	500	89,892	5,971	------	95,363	500	95,863	-----	---
3505	Tri-State---------	20,786	400,152	------	9,368	409,520	------	------	400,152	9,368	409,520	9,374	---
3521	Midwest Breeders--	39,877	558,057	81,701	19,212	658,970	70,690	25,605	710,448	44,817	755,265	-----	---
3575	ABS---------------	2/81,844	1,246,139	112,905	195,935	1,554,979	------	------	1,359,044	195,935	1,554,979	-----	---
4101	Minnesota Valley--	31,540	256,637	36,408	3,973	297,018	1,040	11,920	294,085	15,893	309,978	-----	---
4801	Kansas ABSU-------	2,609	38,294	2,560	11,870	52,724	4,187	26,853	45,041	38,723	83,764	-----	2
5102	Maryland-W. Va----	4,035	68,290	11,455	4,631	84,376	4,102	989	83,847	5,620	89,467	-----	5
5201	Virginia ABA------	6,751	65,531	10,134	1,788	77,453	3,833	553	79,498	2,341	81,839	-----	---
5501	N. C. Instit. B.P-	10	926	------	------	926	45	------	971	------	971	-----	---
6102	Select Sires------	37,797	250,880	43,904	31,476	326,260	102,960	37,877	397,744	69,353	467,097	220	4
6301	East Tennessee----	2/2,106	17,725	2/4,519	2/3,400	25,644	------	3,975	22,244	7,375	29,619	-----	---
6302	Tennessee ABA-----	5,000	22,194	7,263	350	29,807	------	------	29,457	350	29,807	-----	---
6303	West Tennessee----	782	5,182	680	1,890	7,752	------	------	5,862	1,890	7,752	-----	---
6502	Mississippi ABC---	275	16,000	1,500	275	17,775	4,225	75	21,725	350	22,075	-----	---
7201	Louisiana ABC-----	4,752	58,490	8,953	5,328	72,771	1,860	10,570	69,303	15,898	85,201	-----	---
8701	Cache Valley------	7,305	52,462	5,035	26,714	84,211	3,192	28,131	60,689	54,845	115,534	-----	---
9111	Carnation---------	2/18,830	270,948	61,506	25,314	357,768	------	------	332,454	25,314	357,768	-----	---
9113	All West----------	17,023	132,369	2/16,788	2/19,543	168,700	------	------	149,157	19,543	168,700	-----	6
9303	Excelsior---------	201	35,226	200	40	35,466	18,196	275	53,622	315	53,937	-----	---
9316	Genetics, Inc.----	2,159	174,785	2,999	1,109	178,893	24,621	3,098	202,405	4,207	206,612	-----	---
9401	P.R. AI Center----	357	30,000	2	398	30,400	5,237	------	35,239	398	35,637	18	---
9601	Matanuska Valley--	12	373	------	------	373	------	------	373	------	373	-----	---
3310	Armour & Co.3/----	------	-------	------	6,600	6,600	------	------	-------	6,600	6,600	-----	---
8406	International Beef Breeders 3/-	------	-------	------	45,690	45,690	------	------	-------	45,690	45,690	-----	---
	Private services3/	------	-------	------	116,803	116,803	------	------	-------	116,803	116,803	-----	---
	United States-----------	407,375	6,146,569	714,850	628,470	7,489,889	277,217	166,772	7,138,636	795,242	7,933,878	9,612	442

1/ See table 7 for list of names and addresses of studs.
2/ Data may have been all or partially estimated when incomplete report was given.
3/ Information obtained from National Association of Animal Breeders, P.O. Box 1033, Columbia, Missouri 65201.

Three AI organizations reported that they artificially inseminated 9,612 swine, which is 1,657, or 20.8 percent, more than in 1967. Services to 442 goats were indicated, also an increase from 1967.

Table 6 shows that a total of 2,345 bulls were in AI studs in 1968. This probably exceeds the number of bulls actually used to inseminate cows in 1968, because it includes all bulls reported in studs at any time during the year. It was possible to remove bulls without services from the counts only when the stud reported an actual or estimated number of services by each bull.

The distribution of 1,955 dairy bulls by type of service and breed is shown in table 6. About 53 percent of the dairy bulls were available in regular service, 37 percent were involved in progeny testing only, and 7 percent were available only on a special service basis. Only 1,409 of the dairy bulls were reported as having semen available on January 1, 1969. Most of the 390 beef bulls were reported as in regular service.

Semen from individual bulls is being more widely distributed throughout the country, as evidenced by the fact that 130 bulls were used by two or more studs.

Table 7 lists artificial-breeding organizations active in 1968.

Table 8 lists the States by percentage of dairy cows bred artificially in 1968.

An updated list of Extension Dairymen in charge of AI activity in each State is given on page 14.

TABLE 6.--Bulls used in artificial-breeding organization bull studs during 1968

Stud code	Name of stud 1/	Bulls by breed 2/									Type of service by dairy bulls		
		Ayr-shire	Brown Swiss	Guern-sey	Hol-stein	Jer-sey	Red Dane	Short-horn	Beef	Total	Regular	Special or planned mating	Progeny testing
		Number											
2110	Eastern AIC-------	14	9	26	212	34	--	--	8	303	84	--	211
2309	Atlantic----------	3	4	11	33	5	--	--	17	73	42	8	6
2311	NEBA--------------	5	2	12	57	8	--	--	3	87	28	5	51
3102	NOBA--------------	--	4	13	34	20	--	--	21	92	67	4	---
3303	Curtiss-----------	6	6	14	97	14	--	4	50	191	126	10	5
3401	Michigan ABC------	--	1	7	55	9	4	1	4	81	35	1	41
3407	General Genetics--	--	--	--	4	--	--	--	--	4	--	--	---
3503	East Central------	--	1	1	27	--	--	--	5	34	24	5	---
3505	Tri-State 3/------	--	2	19	49	4	--	2	15	91	--	--	---
3521	Midwest Breeders--	--	4	11	80	3	--	3	21	122	50	13	38
3575	ABS---------------	5	5	12	262	17	--	1	77	379	89	30	183
4101	Minnesota Valley--	4	5	13	85	2	--	5	20	134	108	--	6
4801	Kansas ABSU-------	5	8	10	37	3	--	2	6	71	45	4	16
5102	Maryland-W. Va----	6	3	10	29	6	--	--	7	61	29	--	25
5201	Virginia ABA------	1	--	5	20	4	--	--	2	32	15	11	4
5501	N.C. Instit. B.P--	--	--	--	20	--	--	--	--	20	2	7	11
6102	Select Sires------	2	12	20	82	18	--	3	21	158	58	3	76
6301	East Tennessee----	--	1	4	8	7	--	--	4	24	18	2	---
6302	Tennessee ABA-----	--	2	4	5	6	--	--	3	20	11	6	---
6303	West Tennessee----	--	--	--	9	5	--	--	5	19	14	--	---
6502	Mississippi ABC---	--	--	--	1	5	--	--	2	8	6	--	---
7201	Louisiana ABC-----	--	--	6	10	7	--	--	10	33	8	3	12
8701	Cache Valley------	--	1	1	22	1	--	--	19	44	13	--	12
9111	Carnation---------	1	4	8	39	5	--	2	24	83	59	--	---
9113	All West----------	--	--	12	34	15	--	--	16	77	60	1	---
9303	Excelsior---------	--	1	--	25	--	--	--	--	26	12	4	10
9316	Genetics, Inc-----	--	--	3	24	5	--	--	2	34	13	8	11
9401	P.R. AI Center----	--	--	--	11	--	--	--	--	11	11	--	---
9601	Matanuska Valley--	--	--	--	5	--	--	--	--	5	3	2	---
ALL-BEEF STUD													
8406	International Beef Breeders---------	--	--	--	---	--	--	--	28	28	--	--	---
	United States-----------	52	75	222	1,376	203	4	23	390	2,345	1,030	127	718

1/ See table 7 for list of names and addresses of studs.

2/ These counts are based on where bulls are housed and do not reflect the fact that they are available to more than one stud.

3/ Based on report of January 1, 1968.

TABLE 7.--Artificial-breeding organization bull studs in the United States

State	Stud code	Name and address
Alaska	9601	Matanuska Valley Breeders Association, Box AE, Palmer 99645.
California	9303	Excelsior Farms Artificial Breeding Service, Rt. 1, Box 128, Corona 91720.
	9316	Genetics, Inc., Box 134, Hughson 95326.
Illinois	3303	Curtiss Breeding Service, Inc., Cary 60013.
Kansas	4801	Kansas Artificial Breeding Service Unit, Kansas State University, Manhattan 66506.
Louisiana	7201	La. Animal Breeders Co-op., Inc., Louisiana State University, Box BD, Baton Rouge 70803.
Maryland	5102	Maryland-West Virginia Bull Stud, Inc., Box 555, Frederick 21701.
Michigan	3407	General Genetics, Box 23, Jenison 49428.
	3401	Michigan Animal Breeders Co-op., Inc., Box 511, East Lansing 48823.
Minnesota	4101	Minnesota Valley Breeders Association, New Prague 56071.
Mississippi	6502	Mississippi Animal Breeders Co-op., Drawer BA, State College 39762.
New York	2110	Eastern Artificial Insemination Co-op., Inc., Box 518, Ithaca 14850.
North Carolina	5501	N. C. Institutional Breeding Assoc., 231 Polk Hall, North Carolina State University, Raleigh 27607.
Ohio	3102	NOBA, Inc., Box 607, Tiffin 44883.
	6102	Select Sires, Inc., 1224 Alton-Darby Road, Columbus 43228.
Pennsylvania	2309	Atlantic Breeders Co-op., Box 254, Lancaster 17604.
	2311	Northeastern Breeders Assoc., Inc., R.D. 2, Tunkhannock 18657.
Puerto Rico	9401	Puerto Rico Artificial Insemination Center, Inc., Box 958, Dorado 00646.
Tennessee	6301	East Tennessee ABA, Rt. 10, Tipton Station Road, Knoxville 37920.
	6302	Tennessee Artificial Breeding Assoc., Granny White Pike, Box 67, Brentwood 37027.
	6303	West Tennessee ABA, Box 38, Yorkville 38389.
Utah	8701	Cache Valley Breeding Association, 1950 North Main, Logan 84321.
Virginia	5201	Virginia Animal Breeders Assoc., Inc., Drawer 370, Rocky Mount 24151.
Washington	9113	All West Breeders, Box 197, Burlington 98233.
	9111	Carnation Farms Breeding Service, Carnation 98014.
Wisconsin	3575	American Breeders Service, Inc., De Forest 53532.
	3503	East Central Breeders Association Co-op., Box 191, Highway 26, Waupun 53963.
	3521	Midwest Breeders Co-op., Box 469, Shawano 54166.
	3505	Tri-State Breeders Co-op., Rt. 3, Box 50, Baraboo 53913.
ALL-BEEF STUDS		
Colorado	8406	International Beef Breeders, Inc., Box 29007, Denver 80229.
Illinois	3310	Armour & Co. Beef Cattle Improvement Research, Box 9222, Chicago 60690.

TABLE 8.--Percentage of dairy cows bred artificially in 1968, by States, in order of rank

State	Rank	State	Rank
	Percent		Percent
Florida	81.3	South Carolina	46.7
Hawaii	74.0	Maryland	45.8
Washington	73.4	Nevada	45.7
Connecticut	72.3	North Carolina	43.9
Utah	69.3	Indiana	40.3
Pennsylvania	67.6	Iowa	38.7
New Mexico	63.8	Georgia	38.2
Rhode Island	63.8	Kansas	37.6
New York	63.7	Louisiana	36.4
Wisconsin	63.7	Colorado	35.6
New Jersey	63.3	West Virginia	32.9
Vermont	60.6	Arizona	32.2
Maine	60.6	Missouri	30.6
Ohio	58.8	Kentucky	29.9
Oregon	58.7	Alabama	27.6
Massachusetts	58.4	Montana	26.9
New Hampshire	57.0	Texas	26.6
Delaware	56.9	Wyoming	26.2
Michigan	56.6	Tennessee	26.0
California	54.4	Arkansas	25.6
Alaska	53.4	Nebraska	24.2
Minnesota	51.9	Mississippi	21.4
Idaho	51.6	Oklahoma	18.4
Illinois	50.8	North Dakota	16.3
Virginia	47.4	South Dakota	15.5
		United States	50.5

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Wis------ E. E. Starkey, Dairy Science Dept., University of Wisconsin, Madison 53706.
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Dairy-Herd-Improvement Letter
ARS-44-214
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April 1970

UTILIZATION OF ARTIFICIAL INSEMINATION (AI) BULLS IN THE UNITED STATES IN 1968

by H. D. Norman, B. T. McDaniel, and F. N. Dickinson[1]

An examination of the number of first services to dairy bulls was made to determine the effective use that was being made of artificial insemination (AI) bulls in the United States. The AI organizations were asked to furnish information on the number of first services to individual bulls in 1968. Twenty-six organizations supplied data on the source of semen for 5,994,583 inseminations, thus giving information on 93 percent of all the dairy-to-dairy services to AI bulls in the United States in 1968. In four of the AI organizations the numbers of first services were estimated because the only information available was on the total ampules of semen used. These estimates were based on information available from the organizations on the average number of ampules required per breeding.

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[1] With the technical assistance of C. A. Rampendahl and J. J. Corbin. The authors wish to express their appreciation to the AI organizations for furnishing the information used in this report.

Issued June 1970

Each bull was placed in one of the following categories according to the type of service he was in: regular service; available on special request only; in a progeny-test program. A regular-service code meant that semen was widely and generally available to the patrons. Many of those coded as special-request bulls were dead and only a limited supply of semen was available.

The numbers of bulls and the total numbers of inseminations are given by breed and type of service in table 1. Although 1,589 bulls were used, the 1,010 bulls in regular service accounted for 95 percent of the services while the progeny-test bulls accounted for 4 percent.

Table 2 shows that in every breed over 93 percent of the AI services were to regular-service bulls. A maximum of 4.7 percent of the services in any breed (Guernseys) was to bulls in a progeny-test program. The percentages of services from bulls in the special-mating category ranged from zero to 2.2 percent. With less than 5 percent of the services going to progeny-test bulls, it is likely that either not enough young bulls are being sampled or not enough inseminations are being made from each young bull. This is particularly true in the breeds other than Holstein because of the smaller population size.

About 84 percent of all inseminations in this study were to bulls of the Holstein breed (table 2). The Guernseys and Jerseys each accounted for about 6 percent of the services. The Brown Swiss, Ayrshire, and Milking Shorthorn breeds accounted for 2.5, 1.1, and 0.5 percent of the services, respectively.

The average number of inseminations per bull for each breed and type of services is given in table 3. All bulls in regular service averaged 5,649 inseminations. The Holsteins in regular service averaged 7,614 inseminations, three times that for the regular-service bulls of other breeds. One Holstein bull had 61,835 services, approximately three times as many as the highest bull in each of the Guernsey, Jersey, and Brown Swiss breeds. This most likely reflects differences

TABLE 1.--Number of bulls and inseminations by breed and type of service on which data for number of services by individual bulls were reported in 1968

Breed	Bulls				Services			
	Regular	Special mating	Progeny test	All used	Regular	Special mating	Progeny test	All used
	Number							
Ayrshire-----	41	0	9	50	65,050	0	1,514	66,564
Guernsey-----	139	16	44	199	357,379	4,694	17,975	380,048
Holstein-----	628	72	354	1,054	4,781,400	53,352	181,493	5,016,245
Jersey-------	122	15	52	189	333,096	6,533	14,029	353,658
Brown Swiss--	56	5	11	72	141,892	3,333	5,914	151,139
M.Shorthorn--	20	1	0	21	26,474	207	0	26,681
Red Dane-----	4	0	0	4	248	0	0	248
Total-----	1,010	109	470	1,589	5,705,539	68,119	220,925	5,994,583

TABLE 2.--Percentage distributions of inseminations by breed and type of service and estimated total AI services for data available in 1968

Breed	Type of service			Total among breeds	Approximate total AI services by breed of bull in 1968 [2] [3]
	Regular	Special mating	Progeny test		
	Percent[1]				Number
Ayrshire------	97.7	0	2.3	1.1	71,000
Guernsey------	94.1	1.2	4.7	6.3	407,000
Holstein------	95.3	1.1	3.6	83.7	5,375,000
Jersey--------	94.2	1.8	4.0	5.9	379,000
Brown Swiss---	93.9	2.2	3.9	2.5	162,000
M. Shorthorn--	99.2	0.8	0	0.5	29,000
Red Dane------	100.0	0	0	([4])	248

[1] Percentages within breeds.

[2] Calculated by multiplying the 6,423,786 dairy-to-dairy services in 1968 by appropriate percentage.

[3] This represents number of services to all breeds of cows by bulls of all breeds in all types of services.

[4] Less than 0.05 percent.

TABLE 3.--Average number of inseminations per bull by breed and type of service and maximum number of services for an individual bull for data available in 1968

Breed	Type of service			Overall	Maximum services for an individual bull
	Regular	Special mating	Progeny test		
	Number				
Ayrshire-----	1,587	0	168	1,331	8,648
Guernsey-----	2,571	293	409	1,910	20,480
Holstein-----	7,614	741	513	4,759	61,835
Jersey-------	2,730	436	270	1,871	18,848
Brown Swiss--	2,534	667	538	2,099	21,568
M. Shorthorn-	1,324	207	0	1,271	4,716
Red Dane-----	62	0	0	62	114

in demands considering that a New Zealand summary[2] shows that maximum service was from Jersey bulls. Ten New Zealand Jersey bulls used as extensively as possible in 1967 because of high milk fat ratings on their daughters averaged 43,188 inseminations, and one of these had 59,451 inseminations. The nine New Zealand Holsteins having the highest milk fat rating averaged 25,446 inseminations, and the maximum number of inseminations for an individual bull was 40,651.

Table 4 shows the distribution of regular-service bulls with regard to the number of inseminations. It is clear that many of the bulls will have little impact upon the population as a result of 1968 services. The 346 bulls that were bred to 5,000 or more cows accounted for 81 percent of the services while the other 664 bulls accounted for 19 percent.

It is clear that complete utilization has not been made of the AI bulls in regular service. Only 285 bulls would have been needed in 1968 instead of the 1,010 used if 20,000 inseminations had been made to each in regular service. Based on New Zealand results 2/ it appears that an AI organization trying to make full use of their best bulls could average more than 20,000 inseminations to each. Even at 10,000 inseminations per regular-service bull, only 571 bulls would have been needed to inseminate the 5,705,539 cows bred. This would have permitted the elimination of the lowest 43 percent of the bulls based on production data, or would have allowed more selection among bulls on the basis of other economically important traits in addition to yield.

The number of inseminations that were made to bulls coded as special request and on progeny test are given in tables 5 and 6, respectively. Sixty-one bulls coded as being on progeny test had more than 1,000 services, and two of these had more than 5,000 services. The other 409 progeny-test bulls each had less than 1,000 services in 1968.

2/ New Zealand Dairy Board, Artificial Breeding, Seventh Annual Report, No. 44, 1967-68 season.

TABLE 4.--The distribution of bulls in regular service by breed and number of inseminations for data available in 1968

Breed	Inseminations per bull grouped by interval				
	1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999	20,000 and over
	------------------ Number ------------------				
	Bulls in each class				
Ayrshire-----	17	23	1	0	0
Guernsey-----	59	61	12	6	1
Holstein-----	129	203	135	102	59
Jersey-------	49	51	16	6	0
Brown Swiss--	25	23	6	1	1
M. Shorthorn-	9	11	0	0	0
Red Dane-----	4	0	0	0	0
	Services to bulls in each class				
Ayrshire-----	5,140	51,262	8,648	0	0
Guernsey-----	18,321	160,869	88,848	68,861	20,480
Holstein-----	50,934	577,455	944,844	1,462,516	1,745,651
Jersey-------	19,882	119,631	121,260	72,323	0
Brown Swiss--	7,504	58,035	37,844	16,941	21,568
M. Shorthorn-	1,904	24,570	0	0	0
Red Dane-----	248	0	0	0	0

TABLE 5.--The distribution of bulls in service available only through special request by breed and number of inseminations for data available in 1968

Breed	Inseminations per bull grouped by interval		
	1 to 999	1,000 to 4,999	5,000 to 9,999
	Number		
		Bulls in each class	
Ayrshire---------	0	0	0
Guernsey---------	14	2	0
Holstein---------	56	14	2
Jersey-----------	14	1	0
Brown Swiss------	4	1	0
M. Shorthorn-----	1	0	0
Red Dane---------	0	0	0
		Services to bulls in each class	
Ayrshire---------	0	0	0
Guernsey---------	1,326	3,368	0
Holstein---------	14,562	25,815	12,975
Jersey-----------	4,410	2,123	0
Brown Swiss------	1,333	2,000	0
M. Shorthorn-----	207	0	0
Red Dane---------	0	0	0

TABLE 6.--The distribution of bulls in service only for progeny testing by breed and number of inseminations for data available in 1968

Breed	Inseminations per bull grouped by interval		
	1 to 999	1,000 to 4,999	5,000 to 9,999
	Number		
		Bulls in each class	
Ayrshire---------	9	0	0
Guernsey---------	40	4	0
Holstein---------	302	50	2
Jersey-----------	48	4	0
Brown Swiss------	10	1	0
M. Shorthorn-----	0	0	0
Red Dane---------	0	0	0
		Services to bulls in each class	
Ayrshire---------	1,514	0	0
Guernsey---------	9,755	8,220	0
Holstein---------	79,193	91,874	10,426
Jersey-----------	8,878	5,151	0
Brown Swiss------	4,424	1,490	0
M. Shorthorn-----	0	0	0
Red Dane---------	0	0	0

Inseminations averaging 20,000 per year and four years of useful life from each new bull put in regular service means that at least 60 Holsteins, 4 Guernseys, 4 Jerseys, 2 Brown Swiss, and 1 Ayrshire must be placed in regular service each year. It appears that overall there are not enough bulls being sampled through progeny testing to maintain the number of bulls needed in regular service in each breed and at the same time have a satisfactory selection differential on the bulls placed in regular service. This deficiency could result in two possibilities: (1) AI progeny-tested bulls with less-than-superior genetic merit for yield will be placed in regular service just to get the cow population bred and/or; (2) bulls with non-AI preliminary summaries will be placed in regular service before precise information on their transmitting ability in the general population is known.

Table 7 shows the distribution of all bulls with regard to the number of inseminations. The basis of the more effective utilization of Holstein bulls is evident in that a higher percentage of the bulls of that breed had over 5,000, 10,000, and 20,000 services each.

Some changes in patterns of insemination are apparent by comparing the data for 1967 and 1968. The comparisons between the two years were made using only data from AI organizations that reported individual number of services in both the years being compared. The numbers of bulls included in the averages are given in table 8 and the changes in the average number of inseminations per bull are given in table 9. The average inseminations per regular-service bull decreased from 1967 to 1968 for each breed except Brown Swiss and Red Dane. The average number of inseminations per progeny-test bull decreased for all breeds having a progeny-test program.

Table 10 shows changes in the percent distribution of inseminations going to the various types of bulls. In the breeds other than Ayrshire, the percent of services going to regular-service bulls gained at the expense of bulls in other categories. This is a shift that may produce deficiencies in the number of new bulls entering service with precise genetic proofs in future years.

TABLE 7.--The distribution of bulls by breed and number of inseminations for data available in 1968

Breed	Inseminations per bull in all categories of service				
	1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999	20,000 and over
	Number				
	Bulls in each class				
Ayrshire-----	26	23	1	0	0
Guernsey-----	113	67	12	6	1
Holstein-----	487	267	139	102	59
Jersey-------	111	56	16	6	0
Brown Swiss--	39	25	6	1	1
M. Shorthorn-	10	11	0	0	0
Red Dane-----	4	0	0	0	0
	Services to bulls in each class				
	Percent				
Ayrshire-----	10.0	77.0	13.0	----	----
Guernsey-----	7.7	45.4	23.4	18.1	5.4
Holstein-----	2.9	13.9	19.3	29.2	34.8
Jersey-------	9.4	35.9	34.3	20.4	----
Brown Swiss--	8.8	40.7	25.0	11.2	14.3
M. Shorthorn-	7.9	92.1	----	----	----
Red Dane-----	100.0	----	----	----	----

TABLE 8.--Number of bulls by breed and type of service for data available for 1967 and 1968[1/]

Breed	Type of service						Overall	
	Regular		Special mating		Progeny test			
	Bulls used in-		Bulls used in-		Bulls used in-		Bulls used in-	
	1967	1968	1967	1968	1967	1968	1967	1968
	Number							
Ayrshire------	40	41	3	0	3	9	46	50
Guernsey------	134	135	22	13	48	44	205	192
Holstein------	607	613	84	65	337	345	1,028	1,023
Jersey--------	114	113	17	15	67	50	198	178
Brown Swiss---	56	55	7	5	18	11	81	71
M. Shorthorn--	18	20	2	1	2	0	22	21
Red Dane------	4	4	0	0	0	0	4	4

[1/] Comparisons are made only on identical AI studs reporting for 1967 and 1968.

TABLE 9.--Comparison of average number of inseminations per bull by breed and type of service for data available for 1967 and 1968 [1/]

Breed	Type of service			Overall
	Regular	Special mating	Progeny test	
	Changes in average number of inseminations per bull from 1967 to 1968			
	Number			
Ayrshire-------	-539	-196	-317	-562
Guernsey-------	-371	-319	-409	-270
Holstein-------	-243	-488	-412	-259
Jersey---------	-493	-607	-95	-216
Brown Swiss----	+454	-175	-708	+309
M. Shorthorn---	-46	+138	-2,570	-90
Red Dane-------	+8	0	0	+8

[1/] Comparisons are made only on identical AI studs reporting for 1967 and 1968.

TABLE 10.--Comparison of percentage distributions of inseminations by breed and type of service for data available for years 1967 and 1968

Breed	Type of service			Changes in percent of cows bred by bulls of different breeds from--
	Regular	Special mating	Progeny test	
	Change from--	Change from--	Change from--	
	1967 to 1968	1967 to 1968	1967 to 1968	1967 to 1968
	Percent[1/]			
Ayrshire----	0	-0.7	+0.6	-0.3
Guernsey----	+5.8	-2.0	-3.8	-.7
Holstein----	+3.4	-1.0	-2.4	+1.6
Jersey------	+4.1	-2.3	-1.9	-.9
Brown Swiss-	+13.2	-1.8	-11.3	+.2
M.Shorthorn-	+16.8	+.3	-17.2	-.1
Red Dane----	0	----	----	(2/)

1/ Percentages within breeds.
2/ Less than 0.05 percent.

Table 11 indicates that the total number of inseminations from bulls having under 1,000 or over 10,000 services while in regular service has decreased, while total services from bulls having between 1,000 and 10,000 inseminations increased from 1967 to 1968. This more nearly balanced distribution of services for bulls means that the effective number of AI bulls in service increased slightly from 1967 to 1968. The decrease in total services for bulls with more than 10,000 inseminations also explains the slight decrease in the average inseminations per bull.

These results raise a few questions that dairymen and AI units should consider because of the economic importance they have upon their particular organization. Are all bulls now kept for regular service really needed, or is it possible to accelerate genetic improvement for the dairymen and reduce semen production costs by greater utilization of fewer bulls? A second question the dairymen should ask the particular organization they are purchasing service from is: Are enough bulls being sampled in your stud through a progeny-test program to offer a satisfactory base from which to select proven sires for regular use?

TABLE 11.--Comparison of the distribution of bulls in regular service by breed and number of inseminations for data available for 1967 and 1968

	Inseminations per bull grouped by interval				
Breed	1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999	20,000 and over
	Percent of total regular dairy services in 1968[1/][2/]				
Ayrshire-----	0.1	0.9	0.2	-------	--------
Guernsey-----	.3	2.8	1.6	1.2	0.4
Holstein-----	.9	10.1	16.6	25.6	30.6
Jersey-------	.4	2.1	2.1	1.3	--------
Brown Swiss--	.1	1.0	.7	.3	.4
M. Shorthorn-	(3/)	.4	-------	-------	--------
	Actual change for 1967 to 1968 in number of services				
Ayrshire-----	-1,071	+882	-5,633	-14,164	--------
Guernsey-----	-7,982	+16,580	+5,565	-6,742	-54,554
Holstein-----	-2,867	+117,360	+38,151	-125,863	-127,792
Jersey-------	-965	+17,978	+6,150	-50,116	-32,176
Brown Swiss--	-3,336	+8,414	-497	+16,941	+1,356
M. Shorthorn-	-2,054	+3,865	-------	--------	--------

1/ Data for 1968 are percentages of all inseminations within a class interval in the regular service category.

2/ See table 4 for the distribution of bulls by breed and number of inseminations in the regular-service category.

3/ Less than .05 percent.

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Dairy-Herd-Improvement Letter
ARS-44-215
(Vol. 46, No. 2)

May 1970

DHIA PARTICIPATION REPORT, JANUARY 1, 1970[1]

The National Cooperative Dairy Herd Improvement Program is a composite of the Official DHI (including DHIR), Owner-Sampler, Weigh-a-Day-a-Month (WADAM), and other unofficial recordkeeping plans. For the first time, other unofficial DHI plans are being counted as part of the National Cooperative DHI Program in this annual DHIA Participation Report. This change in procedure has been followed in all tables and in calculating the totals and percentages of herds and cows on test. Therefore, the totals and percentages across recordkeeping plans are not directly comparable to those which have been compiled in past years.

On January 1, 1970, the Program included 59,629 herds with 3,120,143 cows, which is 24.6 percent of the Nation's dairy cow population. The cows were in 1,267 associations with 2,225 supervisors. Official DHI (including DHIR), included 34,308 herds and 2,122,011 cows for an average of 61.9 cows per herd; DHIR included 3,814 herds and 235,829 cows averaging 61.8 cows per herd; and Owner-Sampler included 23,281 herds and 839,343 cows for an average of 36.1 cows per herd. Similar

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[1] Prepared by G. J. King, F. N. Dickinson, C. A. Rampendahl, J. J. Corbin, and A. H. Kienast from data supplied by the State Extension dairymen in charge of DHIA recordkeeping.

Issued July 1970

figures for WADAM were 703 herds, 47,493 cows, and 67.6 cows per herd. The other unofficial plans included 1,337 herds and 111,296 cows for an average of 83.2 cows per herd.

The percentage of the Nation's cows enrolled in Official DHI was 16.7, up from 16.4 percent in 1969. DHIR enrolled 1.9 percent of the Nation's cows, the same percentage enrolled in 1969. Owner-Sampler cows increased to 6.6 percent from 6.5 percent of the Nation's cows in 1969, and WADAM increased to 0.4 percent from 0.3 percent in 1969. Enrollment in other unofficial plans comprised 0.9 percent of the Nation's cows in their first tabulation.

The percentages increased for Official DHI and Owner-Sampler because the U.S. dairy cow population dropped from 13,038,000 January 1, 1969,to 12,689,000 January 1, 1970, a decrease of 349,000. Details of the participation in the various recordkeeping plans are given in tables 4 through 8.

Part of the information in table 1 is presented this year for the first time. It contains a listing of States that have State dairy herd improvement associations and those that hold membership in the National Dairy Herd Improvement Association (NDHIA), Inc. These facts are also shown on the map on page 19. Establishing a State DHIA is important to the development and growth of sound dairy recordkeeping programs in any State. In 1969, three more State-level DHI Associations were formed. Twenty-two States were members of NDHIA, Inc. as of January 1, 1970. The work of Don Voelker, Federal Extension Dairyman for July-December 1969, was most helpful in this development, and Marvin Senger, Federal Extension Dairyman for calendar year 1970, is providing guidance to other States which are in the process of forming State DHI Associations.

The number of counties, associations, and supervisors in the Program have also been included in table 1. The number of counties include only those that have the Official DHI, Owner-Sampler, and/or WADAM plans. Information on additional counties having only other unofficial plans was not available.

Table 2 lists the percentages of all milk cows included in all recordkeeping plans. It was included in the March 1969 DHI Letter as table 14. This year, the map on page 20 is included to show graphically the data in table 2. The data show California as the only State with more than 50 percent of its cows on test. Five States follow closely with between 40 and 49.9 percent of cows on test; the largest group of States is 16 having between 20 and 29.9 percent of cows on test; five States still have less than 10 percent of their cows on test.

Table 3 summarizes the data for participation in each recordkeeping plan. Footnote 1 gives the titles of the unofficial plans other than Owner-Sampler and WADAM. The titles of these plans by States are listed in table 8, footnotes 4 to 10. Table 3, footnote 4, lists 3,455 herds and 115,409 cows on unofficial recordkeeping plans not under the auspices of the National Program, such as Vocational Agriculture, independent testers, and private testing.

Figures for Official DHI in table 4 indicate that there are fewer herds and cows on test than a year ago. However, herd size increased 1.8 cows per herd. This increase — to 61.9 cows per herd — is a doubling in herd size since 1953. More than 36 years were required for such a doubling in herd size to occur before 1953.

Table 5 lists herds and cows on DHIR. These are included in Official DHI as the various plans are tabulated, but are listed in table 5 to show relative numbers and percentages that DHIR recordkeeping comprises. The number of herds and cows on DHIR also decreased in 1969.

Owner-Sampler recordkeeping detailed by State in table 6 also showed losses in herds and cows.

WADAM recordkeeping presented in table 7 showed a different trend as herds on test continued to decrease, but cows on test, having declined by January 1, 1969, rose by January 1, 1970. The cows per herd thus increased from 62.3 on January 1, 1969, to 67.6 on January 1, 1970.

Table 8 is also new this year. It includes the same details for participation in other unofficial plans as tables 4 to 7 do for Official DHI, Owner-Sampler, and WADAM. Its figures show that there are almost twice as many herds and more than twice as many cows on other unofficial plans than on WADAM.

Table 9 has been changed somewhat from the table 5 of former years. The numbers of herds and cows have been omitted; reference to DHIR has been omitted because DHIR records have always been, by definition, 100 percent computer-processed; and figures for other unofficial plans have been added.

Tables 10 to 13 refer to material in the participation report rather than to subjects included last year. The material on lactation records received by USDA, errors, and rejects will be presented in another DHI Letter.

Table 10 is a history of DHI work in the United States since its beginning in 1906. Although the number of associations and supervisors given are for the total National Program, all figures for herds, cows, and production are for Official DHI only.

In table 11, enrollment and production in Official DHI have been compared to the numbers and production of all milk cows in the United States for 14 years -- since the WADAM plan was included in the National Program.

A 14-year summary for the number of cows on test in the various plans and the proportion that each number is of the national dairy herd is given in table 12.

Table 13 is the listing of counties that have 40 percent or more of their cows included in the National Cooperative DHI Program. The percentage of counties having 25 percent or more of their cows on test is given in parentheses at the end of each State's listing.

The data included on unofficial recordkeeping, when compared with unpublished data from previous years, seem to show a trend to dairy recordkeeping plans which are attractive to more dairymen because of cost, convenience, or type of record received. The widespread use of such plans should result in more net income to more dairymen — a primary goal of the National Cooperative DHI Program.

TABLE 1.--The National Cooperative Dairy Herd Improvement Program organization (January 1, 1970)

State	State DHIA organization	Member of NDHIA, Inc.	Counties that have at least one testing program	Associations	Supervisors
			Number	Number	Number
Alabama----------	No	No	52	21	22
Alaska-----------	No	No	2	2	2
Arizona----------	No	No	5	4	8
Arkansas---------	Yes	Yes	22	11	15
California-------	Yes	Yes	45	28	122
Colorado---------	Yes	Yes	29	16	20
Connecticut------	Yes	Yes	8	7	20
Delaware---------	Yes	No	3	3	4
Florida----------	Yes	Yes	34	11	15
Georgia----------	No	No	88	29	31
Hawaii-----------	Yes	No	4	1	3
Idaho------------	No	No	29	28	28
Illinois---------	No	No	82	51	73
Indiana----------	Yes	No	78	52	71
Iowa-------------	Yes	Yes	97	71	95
Kansas-----------	Yes	No	87	56	53
Kentucky---------	Yes	Yes	72	31	46
Louisiana--------	Yes	No	34	24	29
Maine------------	No	No	16	12	24
Maryland---------	Yes	Yes	16	16	32
Massachusetts-----	Yes	Yes	11	10	22
Michigan---------	Yes	Yes	77	55	87
Minnesota--------	Yes	No	84	77	194
Mississippi-------	No	No	49	20	25
Missouri---------	Yes	Yes	81	41	59
Montana----------	No	No	14	6	7
Nebraska---------	Yes	Yes	61	29	34
Nevada-----------	No	No	5	3	3
New Hampshire-----	Yes	No	9	9	15
New Jersey--------	Yes	No	12	8	20
New Mexico--------	Yes	No	11	3	8
New York---------	Yes	Yes	49	49	183
North Carolina----	Yes	Yes	81	39	50
North Dakota------	No	No	39	12	12
Ohio-------------	Yes	No	85	71	136
Oklahoma---------	No	No	54	16	20
Oregon-----------	Yes	Yes	26	15	20
Pennsylvania------	Yes	Yes	61	61	160
Puerto Rico 1/----	Yes	No	7	1	1
Rhode Island------	Yes	No	4	2	2
South Carolina----	No	No	36	24	25
South Dakota------	Yes	No	63	18	21
Tennessee---------	No	No	60	40	36
Texas------------	Yes	Yes	78	23	27
Utah-------------	Yes	Yes	17	17	18
Vermont----------	Yes	Yes	14	27	52
Virginia---------	Yes	Yes	81	38	51
Washington--------	Yes	Yes	30	23	43
West Virginia-----	Yes	No	28	12	18
Wisconsin---------	Yes	Yes	70	41	157
Wyoming----------	No	No	7	3	6
The Nat'l. Coop. DHI Program-----	36	22	2,107	1,267	2,225

1/ Based on last report available (1-1-69).

TABLE 2.--Percentage of cows, by State, included in the program: Official DHI, Owner-Sampler, and WADAM, and other unofficial plans

State	Rank	State	Rank
	Percent		Percent
California	50.2	Oregon	26.1
Hawaii	47.6	Indiana	25.5
Arizona	43.0	Alabama	24.6
South Carolina	42.3	Rhode Island	23.4
Nevada	40.4	Illinois	23.1
Connecticut	40.1	Kansas	22.5
New Mexico	38.6	Florida	19.6
New Hampshire	34.7	Colorado	19.1
Delaware	34.3	West Virginia	19.0
New Jersey	33.8	Minnesota	18.3
Pennsylvania	32.6	Iowa	18.1
Massachusetts	32.3	Oklahoma	16.8
Maine	31.8	Idaho	16.5
Vermont	31.0	Montana	15.9
North Carolina	30.4	Louisiana	12.9
Virginia	29.7	Mississippi	12.6
Georgia	29.2	Nebraska	11.4
Utah	28.9	Wyoming	10.9
Washington	28.9	Missouri	10.8
Alaska	28.6	Tennessee	10.6
New York	28.0	Texas	9.5
Michigan	27.9	South Dakota	9.1
Wisconsin	27.8	Arkansas	8.8
Maryland	26.9	Kentucky	7.9
Ohio	26.9	North Dakota	5.0
		United States	24.6

TABLE 3.--The National Cooperative Dairy Herd Improvement Program and other testing programs (January 1, 1970)

State	Official DHI (incl. DHIR)		Owner-Sampler		Weigh-a-Day -a-Month		Other unofficial plans 1/		All testing programs		Milk cows in U.S.	
	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Total 2/	In all plans
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Thousands	Percent
Ala-------	299	33,078	7	585	6	276	------	-------	312	33,939	138	24.6
Alaska----	5	193	8	321	------	------	------	-------	13	514	1.8	28.6
Ariz------	64	13,785	25	8,140	------	------	------	-------	89	21,925	51	43.0
Ark-------	96	5,411	74	3,136	4	150	------	-------	174	8,697	99	8.8
Calif-----	1,493	324,563	96	7,897	------	------	204	56,893	1,793	389,353	776	50.2
Colo------	246	18,171	21	928	------	------	2	143	269	19,242	101	19.1
Conn------	381	23,699	60	2,507	3	234	------	-------	444	26,440	66	40.1
Del-------	80	4,913	7	174	3	56	------	-------	90	5,143	15	34.3
Fla-------	93	22,235	13	10,434	19	4,585	------	-------	125	37,254	190	19.6
Ga--------	360	33,770	3	354	55	6,699	------	-------	418	40,823	140	29.2
Hawaii----	12	4,174	5	1,356	1	568	------	-------	18	6,098	12.8	47.6
Idaho-----	447	24,902	19	600	------	------	------	-------	466	25,502	155	16.5
Ill-------	1,238	56,407	317	10,979	183	6,891	------	-------	1,738	74,277	322	23.1
Ind-------	918	47,681	364	13,808	------	------	------	-------	1,282	61,489	241	25.5
Iowa------	1,652	61,536	1,190	33,939	3	65	------	-------	2,845	95,540	528	18.1
Kans------	794	40,266	152	6,009	------	------	------	-------	946	46,275	206	22.5
Ky--------	506	25,230	31	1,280	24	1,397	------	-------	561	27,907	354	7.9
La--------	114	10,789	2	132	164	11,713	------	-------	280	22,634	175	12.9
Maine-----	367	18,533	83	3,382	------	------	------	-------	450	21,915	69	31.8
Md--------	616	42,196	73	3,335	------	------	------	-------	689	45,531	169	26.9
Mass------	398	19,248	57	2,052	------	------	------	-------	455	21,300	66	32.3
Mich------	1,470	79,676	1,295	46,778	------	------	124	5,330	2,889	131,784	472	27.9
Minn------	3,291	119,456	2,157	64,972	------	------	------	-------	5,448	184,428	1,008	18.3
Miss------	277	22,898	5	441	19	1,887	------	-------	301	25,226	201	12.6
Mo--------	567	31,366	211	8,543	------	------	------	-------	778	39,909	368	10.8
Mont------	77	5,228	26	1,789	------	------	------	-------	103	7,017	44	15.9
Nebr------	410	20,000	60	2,300	25	742	------	-------	495	23,042	202	11.4
Nev-------	54	3,743	9	1,828	------	------	------	-------	63	5,571	13.8	40.4
N. H------	199	10,619	55	2,117	8	449	------	-------	262	13,185	38	34.7
N. J------	342	22,167	30	3,163	------	------	------	-------	372	25,330	75	33.8
N. Mex----	31	11,641	3	2,269	------	------	------	-------	34	13,910	36	38.6
N. Y------	3,493	193,257	2,135	87,142	------	------	96	6,641	5,724	287,040	1,024	28.0
N. C------	757	54,146	36	1,660	39	1,880	------	-------	832	57,686	190	30.4
N. Dak----	148	6,013	25	700	20	750	------	-------	193	7,463	148	5.0
Ohio------	1,912	88,516	1,130	35,918	------	------	------	-------	3,042	124,434	463	26.9
Okla------	331	22,526	53	2,860	------	------	------	-------	384	25,386	151	16.8
Oreg------	329	25,255	60	3,020	------	------	8	450	397	28,725	110	26.1
Pa--------	3,281	150,493	1,262	44,122	------	------	882	39,564	5,425	234,179	718	32.6
P. R 3/---	7	1,007	------	------	25	5,132	------	-------	32	6,139	---	----
R. I------	32	1,852	------	------	------	------	------	-------	32	1,852	7.9	23.4
S. C------	271	28,842	6	463	8	274	------	-------	285	29,579	70	42.3
S. Dak----	143	5,600	343	11,922	------	------	------	-------	486	17,522	192	9.1
Tenn------	480	31,363	6	175	37	1,574	------	-------	523	33,112	313	10.6
Tex-------	316	30,564	21	1,859	11	904	------	-------	348	33,327	351	9.5
Utah------	393	21,130	23	821	------	------	------	-------	416	21,951	76	28.9
Vt--------	695	38,147	569	25,681	------	------	------	-------	1,264	63,828	206	31.0
Va--------	908	64,272	54	2,307	6	232	------	-------	968	66,811	225	29.7
Wash------	640	49,423	27	1,183	------	------	21	2,275	688	52,881	183	28.9
W. Va-----	186	10,215	22	741	40	1,035	------	-------	248	11,991	63	19.0
Wis-------	3,065	140,258	11,041	372,711	------	------	------	-------	14,106	512,969	1,846	27.8
Wyo-------	24	1,558	10	510	------	------	------	-------	34	2,068	18.9	10.9
Total or percent: The Natl. Coop.DHI Program--	34,308	2,122,011	23,281	839,343	703	47,493	1,337	111,296	59,629	3,120,143	12,689	24.6
All testing Programs 4/	------	---------	------	-------	-----	------	------	-------	63,084	3,235,552	------	25.5

1/ Unofficial plans operating under the auspices of the National Cooperative Dairy Herd Improvement Program such as Tri-Monthly Test, Milk Only Record, Tri-Monthly Fat Test, Tester Sampled, Commercial DHIA, Commercial, Alternate AM-PM, and Tester-Sampler.

2/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

3/ Based on last report available (1-1-69).

4/ The following number of herds and cows are on other testing programs such as Vocational Agriculture, private, independent tester, etc., by State: Arizona, 35 herds, 6,000 cows; California, 19 herds, 75 cows; Colorado, 13 herds, 1,317 cows; Iowa, 250 herds, 4,500 cows; Michigan, 27 herds, 771 cows; New York, 13 herds, 561 cows; North Dakota, 76 herds, 2,010 cows; Wisconsin, 3,022 herds, 100,175 cows. Total = 3,455 herds, 115,409 cows.

TABLE 4.--Official DHI recordkeeping in the United States (January 1, 1970)

State	Official DHI (incl. DHIR)			Change from 1-1-69	Av. cows per herd	All milk cows 1/	DHI cows as percent of all milk cows 2/	Change from 1-1-69	Dairy Herd Improvement Registry 3/	
	Counties	Herds	Cows						Herds	Cows
	Number	Number	Number	Number	Number	Thousands	Percent	Percent	Number	Number
Ala	51	299	33,078	+801	110.6	138	24.0	+1.4	16	1,486
Alaska	2	5	193	-39	38.6	1.8	10.7	-2.7	2	50
Ariz	5	64	13,785	-6,789	215.4	51	27.0	-13.3	21	4,847
Ark	19	96	5,411	+313	56.4	99	5.5	+0.5	12	485
Calif	44	1,493	324,563	-39,064	217.4	776	41.8	-4.8	87	17,069
Colo	24	246	18,171	-325	73.9	101	18.0	-.7	39	2,222
Conn	8	381	23,699	+139	62.2	66	35.9	+.7	66	4,043
Del	3	80	4,913	+252	61.4	15	32.8	+1.7	8	498
Fla	33	93	22,235	+1,651	239.1	190	11.7	+.4	6	959
Ga	80	360	33,770	+2,263	93.8	140	24.1	+1.4	25	3,141
Hawaii	1	12	4,174	+1,142	347.8	12.8	32.6	+10.1	--	-----
Idaho	28	447	24,902	-884	55.7	155	16.1	-.4	33	1,542
Ill	81	1,238	56,407	-1,076	45.6	322	17.5	+.1	132	6,124
Ind	78	918	47,681	+8,272	51.9	241	19.8	+4.2	164	8,774
Iowa	95	1,652	61,536	-577	37.2	528	11.7	+.8	194	7,556
Kans	86	794	40,266	+626	50.7	206	19.5	+.8	115	5,206
Ky	52	506	25,230	+1,497	49.9	354	7.1	+.6	46	1,900
La	24	114	10,789	+240	94.6	175	6.2	+.3	12	1,211
Maine	16	367	18,533	+628	50.5	69	26.9	+1.0	55	3,150
Md	16	616	42,196	+1,156	68.5	169	25.0	+.9	89	7,123
Mass	11	398	19,248	-784	48.4	66	29.2	+.2	84	3,820
Mich	69	1,470	79,676	+44	54.2	472	16.9	+.1	113	7,615
Minn	84	3,291	119,456	-4,334	36.3	1,008	11.9	+.2	171	7,037
Miss	47	277	22,898	-9	82.7	201	11.4	+.4	24	2,019
Mo	76	567	31,366	+2,043	55.3	368	8.5	+.8	73	4,474
Mont	9	77	5,228	+138	67.9	44	11.9	+.8	11	714
Nebr	53	410	20,000	+662	48.8	202	9.9	+.7	45	3,125
Nev	5	54	3,743	-1,005	69.3	13.8	27.1	-7.6	13	680
N. H	9	199	10,619	+306	53.4	38	27.9	+1.5	45	2,454
N. J	11	342	22,167	-321	64.8	75	29.6	+1.1	53	3,675
N. Mex	11	31	11,641	+4,851	375.5	36	32.3	+14.4	11	2,901
N. Y	49	3,493	193,257	+5,250	55.3	1,024	18.9	+.8	305	17,541
N. C	79	757	54,146	+3,769	71.5	190	28.5	+2.4	53	4,103
N. Dak	31	148	6,013	-258	40.6	148	4.1	+.1	14	600
Ohio	83	1,912	88,516	-213	46.3	463	19.1	+.4	362	17,841
Okla	54	331	22,526	+3,338	68.1	151	14.9	+2.5	46	2,969
Oreg	26	329	25,255	-1,345	76.8	110	23.0	-.5	39	3,105
Pa	61	3,281	150,493	-7,345	45.9	718	21.0	-.7	226	12,845
P. R. 4/	7	7	1,007	0	143.9	-----	----	----	---	------
R. I	4	32	1,852	-56	57.9	7.9	23.4	-.2	17	829
S. C	35	271	28,842	-419	106.4	70	41.2	+.6	40	5,331
S. Dak	55	143	5,600	-1,314	39.2	192	2.9	-.5	25	1,074
Tenn	56	480	31,363	+523	65.3	313	10.0	+.6	44	2,986
Tex	76	316	30,564	-2,838	96.7	351	8.7	-.5	63	5,906
Utah	17	393	21,130	-1,188	53.8	76	27.8	-2.0	24	1,399
Vt	14	695	38,147	-188	54.9	206	18.5	+.2	114	6,185
Va	79	908	64,272	+483	70.8	225	28.6	+1.0	83	6,357
Wash	30	640	49,423	+6,709	77.2	183	27.0	+4.0	91	6,480
W. Va	22	186	10,215	+554	54.9	63	16.2	+1.8	18	1,223
Wis	68	3,065	140,258	+5,664	45.8	1,846	7.6	+.5	482	23,013
Wyo	7	24	1,558	+115	64.9	18.9	8.2	+.8	3	142
Total, average, or percent	1,984	34,308	2,122,011	-16,942	61.9	12,689	16.7	+.3	3,814	235,829

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

2/ Percentage of cows included in the Official DHI (including DHIR) recordkeeping plan.

3/ Included in count of Official DHI herds and cows.

4/ Based on last report available (1-1-69).

TABLE 5.--Dairy Herd Improvement Registry recordkeeping in the United States (January 1, 1970)

State	Dairy Herd Improvement Registry 1/			Change from 2/ 1-1-69	Av. cows per herd	All milk cows 3/	DHIR cows as pct. of all milk cows 4/
	Counties	Herds	Cows				
	Number	Number	Number	Number	Number	Thousands	Percent
Alabama---------	11	16	1,486	+180	92.9	138	1.1
Alaska----------	2	2	50	+1	25.0	1.8	2.8
Arizona---------	3	21	4,847	+1,732	230.8	51	9.5
Arkansas--------	6	12	485	-308	40.4	99	0.5
California------	24	87	17,069	-7,700	196.2	776	2.2
Colorado--------	12	39	2,222	+619	57.0	101	2.2
Connecticut-----	8	66	4,043	+133	61.3	66	6.1
Delaware--------	2	8	498	-17	62.3	15	3.3
Florida---------	5	6	959	-168	159.8	190	.5
Georgia---------	19	25	3,141	+296	125.6	140	2.2
Hawaii----------	--	---	-----	----	-----	12.8	---
Idaho-----------	14	33	1,542	+37	46.7	155	1.0
Illinois--------	46	132	6,124	-166	46.4	322	1.9
Indiana---------	42	164	8,774	+2,300	53.5	241	3.6
Iowa------------	67	194	7,556	-354	38.9	528	1.4
Kansas----------	55	115	5,206	-492	45.3	206	2.5
Kentucky--------	21	46	1,900	-466	41.3	354	.5
Louisiana-------	6	12	1,211	+221	100.9	175	.7
Maine-----------	3	55	3,150	-26	57.3	69	4.6
Maryland--------	14	89	7,123	-4	80.0	169	4.2
Massachusetts---	10	84	3,820	-375	45.5	66	5.8
Michigan--------	42	113	7,615	-2,006	67.4	472	1.6
Minnesota-------	57	171	7,037	-203	41.2	1,008	.7
Mississippi-----	12	24	2,019	+201	84.1	201	1.0
Missouri--------	34	73	4,474	-116	61.3	368	1.2
Montana---------	4	11	714	+154	64.9	44	1.6
Nebraska--------	18	45	3,125	-73	69.4	202	1.5
Nevada----------	5	13	680	-55	52.3	13.8	4.9
New Hampshire---	9	45	2,454	-92	54.5	38	6.5
New Jersey------	10	53	3,675	+202	69.3	75	4.9
New Mexico------	7	11	2,901	+218	263.7	36	8.1
New York--------	46	305	17,541	-80	57.5	1,024	1.7
North Carolina--	27	53	4,103	-1,049	77.4	190	2.2
North Dakota----	9	14	600	-5	42.9	148	.4
Ohio------------	68	362	17,841	-26	49.3	463	3.9
Oklahoma--------	26	46	2,969	+170	64.5	151	2.0
Oregon----------	16	39	3,105	+155	79.6	110	2.8
Pennsylvania----	49	226	12,845	-697	56.8	718	1.8
Puerto Rico 5/--	--	---	-----	----	-----	---	---
Rhode Island----	3	17	829	+140	48.8	7.9	10.5
South Carolina--	18	40	5,331	-567	133.3	70	7.6
South Dakota----	16	25	1,074	-45	43.0	192	.6
Tennessee-------	22	44	2,986	-651	67.9	313	1.0
Texas-----------	30	63	5,906	-420	93.7	351	1.7
Utah------------	6	24	1,399	-56	58.3	76	1.8
Vermont---------	13	114	6,185	-14	54.3	206	3.0
Virginia--------	37	83	6,357	-368	76.6	225	2.8
Washington------	17	91	6,480	+70	71.2	183	3.5
West Virginia---	10	18	1,223	-129	67.9	63	1.9
Wisconsin-------	61	482	23,013	+219	47.7	1,846	1.2
Wyoming---------	3	3	142	-78	47.3	18.9	.8
Total, average, or percent---	1,045	3,814	235,829	-9,758	61.8	12,689	1.9

1/ Included in count of Official DHI herds and cows in tables 3, 4, and 9.

2/ For January 1, 1969 data, see table 5 in the March 1969 Dairy-Herd-Improvement Letter, ARS-44-210, covering the DHIA Participation Report.

3/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

4/ Percentage of cows included in the Dairy Herd Improvement Registry recordkeeping plan.

5/ Based on last report available (1-1-69).

TABLE 6.--Owner-Sampler recordkeeping in the United States (January 1, 1970)

State	Owner-Sampler			Change from 1-1-69	Av. cows per herd	All milk cows 1/	O.-S. cows as pct. of all milk cows 2/	Change from 1-1-69
	Counties	Herds	Cows					
	Number	Number	Number	Number	Number	Thousands	Percent	Percent
Ala---------	5	7	585	+225	83.6	138	0.4	+0.1
Alaska------	1	8	321	+34	40.1	1.8	17.8	+1.9
Ariz--------	1	25	8,140	+8,140	325.6	51	16.0	+16.0
Ark---------	22	74	3,136	-986	42.4	99	3.2	-.8
Calif-------	18	96	7,897	+967	82.3	776	1.0	+.1
Colo--------	12	21	928	-101	44.2	101	.9	-.1
Conn--------	8	60	2,507	-222	41.8	66	3.8	-.3
Del---------	2	7	174	-11	24.9	15	1.2	0
Fla---------	11	13	10,434	+4,927	802.6	190	5.5	+2.5
Ga----------	2	3	354	-208	118.0	140	.3	-.1
Hawaii------	4	5	1,356	+478	271.2	12.8	10.6	+4.1
Idaho-------	14	19	600	+47	31.6	155	.4	0
Ill---------	28	317	10,979	-656	34.6	322	3.4	-.1
Ind---------	40	364	13,808	+1,166	37.9	241	5.7	+.7
Iowa--------	89	1,190	33,939	-1,150	28.5	528	6.4	+.2
Kans--------	30	152	6,009	+776	39.5	206	2.9	+.4
Ky----------	20	31	1,280	-332	41.3	354	.4	0
La----------	2	2	132	+5	66.0	175	.1	0
Maine-------	12	83	3,382	+25	40.7	69	4.9	0
Md----------	9	73	3,335	+43	45.7	169	2.0	+.1
Mass--------	9	57	2,052	+128	36.0	66	3.1	+.3
Mich--------	70	1,295	46,778	-191	36.1	472	9.9	0
Minn--------	82	2,157	64,972	-5,950	30.1	1,008	6.4	-.3
Miss--------	4	5	441	-70	88.2	201	.2	0
Mo----------	43	211	8,543	+827	40.5	368	2.3	+.3
Mont--------	8	26	1,789	-1,521	68.8	44	4.1	-3.1
Nebr--------	22	60	2,300	-510	38.3	202	1.1	-.2
Nev---------	2	9	1,828	+420	203.1	13.8	13.2	+2.9
N. H--------	8	55	2,117	+39	38.5	38	5.6	+.3
N. J--------	9	30	3,163	-2,484	105.4	75	4.2	-2.9
N. Mex------	1	3	2,269	+255	756.3	36	6.3	+1.0
N. Y--------	48	2,135	87,142	-4,655	40.8	1,024	8.5	-.3
N. C--------	17	36	1,660	-68	46.1	190	.9	0
N. Dak------	14	25	700	+50	28.0	148	.5	+.1
Ohio--------	71	1,130	35,918	-2,909	31.8	463	7.8	-.4
Okla--------	23	53	2,860	+329	54.0	151	1.9	+.3
Oreg--------	14	60	3,020	-900	50.3	110	2.7	-.8
Pa----------	60	1,262	44,122	+1,082	35.0	718	6.1	+.2
P. R 3/-----	--	-----	------	------	----	---	----	----
R. I--------	--	-----	------	------	----	7.9	----	----
S. C--------	7	6	463	+311	77.2	70	.7	+.5
S. Dak------	63	343	11,922	-1,303	34.8	192	6.2	-.3
Tenn--------	6	6	175	-27	29.2	313	.1	0
Tex---------	14	21	1,859	+339	88.5	351	.5	+.1
Utah--------	5	23	821	-210	35.7	76	1.1	-.3
Vt----------	14	569	25,681	-968	45.1	206	12.5	-.3
Va----------	15	54	2,307	+35	42.7	225	1.0	0
Wash--------	14	27	1,183	-348	43.8	183	.6	-.2
W. Va-------	7	22	741	+4	33.7	63	1.2	+.1
Wis---------	70	11,041	372,711	+2,646	33.8	1,846	20.2	+.6
Wyo---------	1	10	510	-505	51.0	18.9	2.7	-2.5
Total, average, or percent--	1,051	23,281	839,343	-2,987	36.1	12,689	6.6	+.1

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

2/ Percentage of cows included in the Owner-Sampler recordkeeping plan.

3/ Based on last report available (1-1-69).

TABLE 7.--Weigh-a-Day-a-Month recordkeeping in the United States (January 1, 1970)

State	Weigh-a-Day-a-Month			Change from 1-1-69	Av. cows per herd	All milk cows 1/	WADAM cows as pct. of all milk cows 2/	Change from 1-1-69
	Counties	Herds	Cows					
	Number	Number	Number	Number	Number	Thousands	Percent	Percent
Ala----------	4	6	276	-233	46.0	138	0.2	-0.2
Alaska-------	--	---	------	-----	----	1.8	---	----
Ariz---------	--	---	------	-----	----	51	---	----
Ark----------	2	4	150	0	37.5	99	.2	-.1
Calif--------	--	---	------	-----	----	776	---	----
Colo---------	--	---	------	-----	----	101	---	----
Conn---------	1	3	234	-115	78.0	66	.4	-.1
Del----------	1	3	56	-2	18.7	15	.4	0
Fla----------	8	19	4,585	+327	241.3	190	2.4	+.1
Ga-----------	28	55	6,699	+1,744	121.8	140	4.8	+1.2
Hawaii-------	1	1	568	+568	568.0	12.8	4.4	+4.4
Idaho--------	--	---	------	-------	-----	155	---	----
Ill----------	40	183	6,891	+244	37.7	322	2.1	+.1
Ind----------	--	---	------	-------	-----	241	---	----
Iowa---------	2	3	65	+15	21.7	528	---	----
Kans---------	--	---	------	-100	-----	206	---	-.2
Ky-----------	20	24	1,397	+378	58.2	354	.4	+.1
La-----------	20	164	11,713	+224	71.4	175	6.7	+.3
Maine--------	--	---	------	-------	-----	69	---	----
Md-----------	--	---	------	-------	-----	169	---	----
Mass---------	--	---	------	-------	-----	66	---	----
Mich---------	--	---	------	-------	-----	472	---	----
Minn---------	--	---	------	-------	-----	1,008	---	----
Miss---------	5	19	1,887	+941	99.3	201	.9	+.4
Mo-----------	--	---	------	-------	-----	368	---	----
Mont---------	--	---	------	-------	-----	44	---	----
Nebr---------	17	25	742	-185	29.7	202	.4	0
Nev----------	--	---	------	-------	-----	13.8	---	----
N. H---------	2	8	449	-121	56.1	38	1.2	-.3
N. J---------	--	---	------	-------	-----	75	---	----
N. Mex-------	--	---	------	-------	-----	36	---	----
N. Y---------	--	---	------	-------	-----	1,024	---	----
N. C---------	22	39	1,880	-349	48.2	190	1.0	-.2
N. Dak-------	14	20	750	+115	37.5	148	.5	+.1
Ohio---------	--	---	------	-------	-----	463	---	----
Okla---------	--	---	------	-70	-----	151	---	----
Oreg---------	--	---	------	-------	-----	110	---	----
Pa-----------	--	---	------	-------	-----	718	---	----
P. R 3/------	19	25	5,132	0	205.3	-----	---	----
R. I---------	--	---	------	-------	-----	7.9	---	----
S. C---------	3	8	274	+121	34.3	70	.4	+.2
S. Dak-------	--	---	------	-------	-----	192	---	----
Tenn---------	21	37	1,574	+252	42.5	313	.5	+.1
Tex----------	6	11	904	-104	82.2	351	.3	0
Utah---------	--	---	------	-------	-----	76	---	----
Vt-----------	--	---	------	-50	-----	206	---	----
Va-----------	4	6	232	-42	38.7	225	.1	0
Wash---------	--	---	------	-------	-----	183	---	----
W. Va--------	16	40	1,035	-196	25.9	63	1.6	-.2
Wis----------	--	---	------	-------	-----	1,846	---	----
Wyo----------	--	---	------	-------	-----	18.9	---	----
Total, average, or percent---	256	703	47,493	+3,362	67.6	12,689	.4	+.1

1/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

2/ Percentage of cows included in the Weigh-a-Day-a-Month recordkeeping plan.

3/ Based on last report available (1-1-69).

TABLE 8.--Other unofficial recordkeeping plans 1/ in the United States (January 1, 1970)

State	Other unofficial plans			Av. cows per herd	All milk cows 2/	Cows in unofficial plans as pct. of all milk cows 3/
	Counties	Herds	Cows			
	Number	Number	Number	Number	Thousands	Percent
California 4/---	10	204	56,893	278.9	776	7.3
Colorado 5/-----	2	2	143	71.5	101	0.1
Michigan 6/-----	36	124	5,330	43.0	472	1.1
New York 7/-----	21	96	6,641	69.2	1,024	.6
Oregon 8/-------	5	8	450	56.3	110	.4
Pennsylvania 9/-	57	882	39,564	44.9	718	5.5
Washington 10/--	8	21	2,275	108.3	183	1.2
Total, average, or percent---	139	1,337	111,296	83.2	12,689	.9

1/ Other unofficial plans operating under the auspices of the National Cooperative Dairy Herd Improvement Program.

2/ Preliminary figures for average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA). The total for U.S. milk cows includes those in States not listed.

3/ Percentage of cows included in other unofficial recordkeeping plans.

4/ Commercial DHIA records.

5/ Commercial records.

6/ Tri-Monthly Test records.

7/ Milk Only Record and Tri-Monthly Fat Test records.

8/ Tester Sampled records.

9/ Supervised Alternate AM-PM records.

10/ Tester-Sampler records.

TABLE 9.--Percent of herds and cows enrolled in State and regional computing centers (January 1, 1970)

State	Official DHI (incl. DHIR)		Owner-Sampler		Weigh-a-Day-a-Month		Other unofficial plans 1/		Machine processing as percent of total recordkeeping	
	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows	Herds	Cows
	Percent									
Ala	100.0	100.0	100.0	100.0	50.0	76.8	-----	-----	99.0	99.8
Alaska	100.0	100.0	100.0	100.0	-----	-----	-----	-----	100.0	100.0
Ariz	100.0	100.0	0	0	-----	-----	-----	-----	71.9	62.9
Ark	100.0	100.0	100.0	100.0	0	0	-----	-----	97.7	98.3
Calif	34.8	38.5	2.7	1.5	-----	-----	0.5	0.4	29.4	32.3
Colo	100.0	100.0	100.0	100.0	-----	-----	100.0	100.0	100.0	100.0
Conn	100.0	100.0	100.0	100.0	100.0	100.0	-----	-----	100.0	100.0
Del	100.0	100.0	100.0	100.0	0	0	-----	-----	96.7	98.9
Fla	100.0	100.0	100.0	100.0	0	0	-----	-----	84.8	87.7
Ga	100.0	100.0	100.0	100.0	83.6	86.2	-----	-----	97.8	97.7
Hawaii	100.0	100.0	100.0	100.0	100.0	100.0	-----	-----	100.0	100.0
Idaho	100.0	100.0	100.0	100.0	-----	-----	-----	-----	100.0	100.0
Ill	100.0	100.0	74.1	74.0	69.9	73.2	-----	-----	92.1	93.7
Ind	100.0	100.0	21.2	25.2	-----	-----	-----	-----	77.6	83.2
Iowa	100.0	100.0	92.7	91.8	0	0	-----	-----	96.8	97.0
Kans	100.0	100.0	100.0	100.0	-----	-----	-----	-----	100.0	100.0
Ky	100.0	100.0	100.0	100.0	100.0	100.0	-----	-----	100.0	100.0
La	100.0	100.0	100.0	100.0	100.0	100.0	-----	-----	100.0	100.0
Maine	100.0	100.0	100.0	100.0	-----	-----	-----	-----	100.0	100.0
Md	100.0	100.0	100.0	100.0	-----	-----	-----	-----	100.0	100.0
Mass	100.0	100.0	96.5	97.1	-----	-----	-----	-----	99.6	99.7
Mich	100.0	100.0	88.4	93.8	-----	-----	100.0	100.0	94.8	97.8
Minn	100.0	100.0	98.1	97.7	-----	-----	-----	-----	99.2	99.2
Miss	100.0	100.0	100.0	100.0	47.4	57.6	-----	-----	96.7	96.8
Mo	100.0	100.0	100.0	100.0	-----	-----	-----	-----	100.0	100.0
Mont	100.0	100.0	100.0	100.0	-----	-----	-----	-----	100.0	100.0
Nebr	100.0	100.0	100.0	100.0	0	0	-----	-----	94.9	96.8
Nev	96.3	95.2	11.1	56.2	-----	-----	-----	-----	84.1	82.4
N. H	100.0	100.0	70.9	70.7	100.0	100.0	-----	-----	93.9	95.3
N. J	100.0	100.0	100.0	100.0	-----	-----	-----	-----	100.0	100.0
N. Mex	100.0	100.0	0	0	-----	-----	-----	-----	91.2	83.7
N. Y	100.0	100.0	97.7	97.3	-----	-----	100.0	100.0	99.1	99.2
N. C	100.0	100.0	100.0	100.0	100.0	100.0	-----	-----	100.0	100.0
N. Dak	100.0	100.0	72.0	88.6	70.0	56.0	-----	-----	93.3	94.5
Ohio	100.0	100.0	40.8	43.3	-----	-----	-----	-----	78.0	83.6
Okla	100.0	100.0	100.0	100.0	-----	-----	-----	-----	100.0	100.0
Oreg	100.0	100.0	100.0	100.0	-----	-----	100.0	100.0	100.0	100.0
Pa	100.0	100.0	100.0	100.0	-----	-----	100.0	100.0	100.0	100.0
P. R 2/	100.0	100.0	-----	-----	100.0	100.0	-----	-----	100.0	100.0
R. I	100.0	100.0	-----	-----	-----	-----	-----	-----	100.0	100.0
S. C	100.0	100.0	100.0	100.0	37.5	8.4	-----	-----	98.2	99.2
S. Dak	100.0	100.0	95.3	97.0	-----	-----	-----	-----	96.7	97.9
Tenn	100.0	100.0	100.0	100.0	21.6	28.7	-----	-----	94.5	96.6
Tex	100.0	100.0	100.0	100.0	36.4	44.4	-----	-----	98.0	98.5
Utah	100.0	100.0	100.0	100.0	-----	-----	-----	-----	100.0	100.0
Vt	100.0	100.0	39.5	37.5	-----	-----	-----	-----	72.8	74.8
Va	100.0	100.0	100.0	100.0	100.0	100.0	-----	-----	100.0	100.0
Wash	100.0	100.0	100.0	100.0	-----	-----	100.0	100.0	100.0	100.0
W. Va	100.0	100.0	100.0	100.0	0	0	-----	-----	83.9	91.4
Wis	100.0	100.0	88.9	88.5	-----	-----	-----	-----	91.3	91.6
Wyo	100.0	100.0	100.0	100.0	-----	-----	-----	-----	100.0	100.0
U.S. percent	97.2	90.6	85.9	80.1	69.0	73.7	84.8	49.1	92.4	87.5

1/ Other unofficial plans operating under the auspices of the National Cooperative Dairy Herd Improvement Program. See table 8 for names of plans by State.

2/ Based on last report available (1-1-69).

TABLE 10.--Status of Dairy Herd Improvement Association work in the United States (1906-1970, inclusive)

Year	Associa-tions 1/	Super-visors 1/	Official DHI Plan							
						Average production				
			Herds	Cows	Cows per herd	Herds reported	Cows reported	Milk	Milk fat	Milk fat
	Number	Number	Number	Number	Number	Number	Number	Pounds	Percent	Pounds
1906---	1	-----	31	239	7.7	------	------	5,300	4.06	215
1907---	4	-----	------	1,606	----	------	------	5,366	4.10	220
1908---	6	-----	------	3,921	----	------	------	-----	----	---
1909---	25	-----	------	11,921	----	------	------	-----	----	---
1910---	40	-----	------	2/25,000	----	------	------	2/5,730	3.96	2/227
1911---	64	-----	------	2/40,000	----	------	------	-----	----	---
1912---	82	-----	------	2/43,000	----	------	------	-----	----	---
1913---	100	-----	------	47,150	----	------	------	-----	----	---
1914---	163	-----	------	73,280	----	------	------	-----	----	---
1915---	211	-----	------	105,526	----	------	------	-----	----	---
1916---	346	-----	------	150,677	----	------	------	-----	----	---
1917---	459	-----	11,720	216,831	18.5	------	------	-----	----	---
1918---	353	-----	9,778	172,518	17.6	------	------	-----	----	---
1919---	385	-----	10,000	167,313	16.7	------	------	-----	----	---
1920---	468	-----	11,948	203,472	17.0	------	------	6,175	4.00	247
1921---	452	-----	11,209	193,928	17.3	------	------	-----	----	---
1922---	513	-----	12,508	215,321	17.2	------	------	-----	----	---
1923---	627	-----	16,357	277,010	16.9	------	------	-----	----	---
1924 3/	---	-----	------	-------	----	------	------	-----	----	---
1925---	732	-----	18,677	307,073	16.4	------	42,302	7,189	3.95	284
1926---	777	-----	19,540	327,653	16.8	------	103,443	7,331	3.96	290
1927---	837	-----	21,128	362,014	17.1	------	116,509	7,411	3.95	293
1928---	947	-----	23,327	414,891	17.8	------	152,412	7,476	3.96	296
1929---	1,090	-----	26,182	465,804	17.8	------	194,859	7,498	3.97	298
1930---	1,143	-----	27,888	507,549	18.2	------	235,624	7,642	3.96	303
1931---	1,112	-----	26,308	510,714	19.4	------	219,924	7,812	3.92	306
1932---	1,005	-----	20,351	427,044	21.0	------	186,683	7,858	3.95	310
1933---	881	-----	15,447	358,501	23.2	------	163,014	7,849	3.99	313
1934---	793	-----	13,694	325,837	23.8	------	203,930	8,015	4.02	322
1935---	809	-----	15,573	364,218	23.4	------	200,367	7,977	4.04	322
1936---	876	-----	17,344	404,412	23.3	------	257,248	7,912	4.03	319
1937---	992	-----	20,772	496,562	23.9	------	354,568	7,923	4.04	320
1938---	1,106	-----	23,701	558,993	23.6	------	448,025	7,831	4.05	317
1939---	1,228	-----	25,949	625,284	24.1	------	507,563	7,977	4.05	323
1940---	1,300	-----	27,948	676,141	24.2	------	545,382	8,133	4.07	331
1941---	1,383	-----	31,381	763,502	24.3	------	591,103	8,225	4.07	335
1942---	1,421	-----	32,957	816,117	24.8	------	514,758	8,323	4.07	339
1943---	1,057	-----	24,155	616,972	25.5	------	375,914	8,325	4.06	338
1944---	954	-----	20,825	561,587	27.0	------	383,337	8,296	4.05	336
1945---	949	-----	21,254	577,200	27.2	------	384,360	8,592	4.03	346
1946---	1,124	-----	23,331	627,878	27.0	------	413,554	8,635	4.04	349
1947---	1,426	-----	28,812	775,546	26.9	------	533,061	8,638	4.03	348
1948---	1,668	-----	33,274	886,129	26.6	------	620,385	8,675	4.03	350
1949---	1,787	-----	35,851	943,939	26.3	------	729,150	8,907	4.03	359
1950---	1,973	-----	40,100	1,088,872	27.2	------	836,922	9,172	4.03	370
1951---	2,143	-----	42,949	1,186,615	27.6	------	885,859	9,195	4.02	370
1952---	2,109	-----	40,105	1,166,297	29.1	------	928,376	9,192	3.98	366
1953---	2,151	-----	40,983	1,226,588	29.9	------	1,020,326	9,253	3.98	368
1954---	2,175	-----	41,254	1,311,698	31.8	------	1,079,557	9,363	3.97	372
1955---	2,288	-----	41,240	1,333,866	32.3	------	1,175,378	9,502	3.95	375
1956---	2,266	-----	40,984	1,406,306	34.4	------	1,229,971	9,713	3.94	383
1957 4/	1,700	2,310	41,638	1,479,799	35.5	------	1,256,129	9,894	3.93	389
1958---	1,544	2,293	39,985	1,548,884	38.7	------	1,345,750	10,068	3.91	394
1959---	1,500	2,337	40,284	1,607,538	39.9	------	1,406,665	10,327	3.88	401
1960---	1,509	2,397	41,293	1,746,752	42.3	------	5/1,343,725	5/10,561	3.87	5/409
1961---	1,395	2,448	42,558	1,867,469	43.9	28,649	1,280,785	10,796	3.87	418
1962---	1,436	2,472	42,034	1,958,355	46.6	32,794	1,531,826	11,032	3.86	426
1963---	1,441	2,516	41,937	2,006,534	47.8	35,378	1,674,803	11,286	3.85	434
1964---	1,420	2,474	40,670	2,010,144	49.4	35,689	1,746,475	11,685	3.83	447
1965---	1,424	2,439	40,075	2,087,581	52.1	35,604	1,821,252	11,976	3.82	457
1966---	1,418	2,378	38,879	2,058,592	52.9	34,886	1,852,533	12,127	3.81	462
1967---	1,344	2,319	37,683	2,098,919	55.7	34,515	1,890,024	12,307	3.80	468
1968---	1,318	2,304	36,869	2,131,929	57.8	(6/).	(6/).	(6/).		(6/).
1969---	1,289	2,250	35,617	2,138,953	60.1	(6/).	(6/).	(6/).		(6/).
1970---	1,267	2,225	34,308	2,122,011	61.9	------	---------	------	----	---

1/ Number of associations and supervisors include all plans.
2/ Estimated.
3/ Date for collecting data changed in 1924 from July 1 to January 1.
4/ Prior to 1957 associations were counted on the basis of supervisor circuits.
5/ National testing year changed in 1960 to begin May 1. These values are averages of 1959 and 1961.
6/ Average production data were not available when this report was compiled.

TABLE 11.--Fourteen-year production summary: U.S. cows and Official DHI cows (1956-1969)

Year 1/	U.S. report for all milk cows					Official DHI Plan			
	Milk cows	Milk produced	Production/cow			Cows	Production/cow		
			Milk	Milk fat	Milk fat		Milk	Milk fat	Milk fat
	Thousands	Mil. lb.	Pounds	Percent	Pounds	Number	Pounds	Percent	Pounds
1956--------	20,501	124,860	6,090	3.83	233	1,479,799	9,713	3.94	383
1957--------	19,774	124,628	6,303	3.81	240	1,548,884	9,894	3.93	389
1958--------	18,711	123,220	6,585	3.78	249	1,607,538	10,068	3.91	394
1959--------	17,901	121,989	6,815	3.76	256	1,746,752	10,327	3.88	401
1960--------	17,515	123,109	7,029	3.76	264	1,867,469	2/10,561	3.87	2/409
1961--------	17,243	125,707	7,290	3.74	273	1,958,355	10,796	3.87	418
1962--------	16,842	126,251	7,496	3.74	280	2,006,534	11,032	3.86	426
1963--------	16,260	125,202	7,700	3.71	286	2,010,144	11,286	3.85	434
1964--------	15,677	126,967	8,099	3.70	300	2,087,581	11,685	3.83	447
1965--------	14,954	124,173	8,304	3.70	307	2,058,592	11,976	3.82	457
1966--------	14,093	119,892	8,507	3.69	314	2,098,919	12,127	3.81	462
1967--------	13,501	118,769	8,797	3.69	325	2,131,929	12,307	3.80	468
1968--------	13,038	117,234	8,992	3.67	330	2,138,953	(3/).	----	(3/).
1969--------	4/12,689	4/116,200	4/9,158	3.67	4/336	2,122,011	(3/).	----	(3/).

1/ Based on succeeding January 1 reports of cows on test in the National Cooperative Dairy Herd Improvement Program.

2/ National testing year changed in 1960 to begin May 1. These values are averages of 1959 and 1961.

3/ Average production data were not available when this report was compiled.

4/ Statistical Reporting Service (USDA), "Milk Production", January 1970. Data are preliminary.

TABLE 12.--Fourteen-year summary of the National Cooperative Dairy Herd Improvement Program: U.S. cows and DHIA cows (1956-1969)

Year 1/	Official DHI plan		Owner-Sampler plan		Weigh-a-Day-a-Month plan		Milk cows in U.S.	
	Cows on test	Proportion of U.S. cows	Cows on test	Proportion of U.S. cows	Cows on test	Proportion of U.S. cows	Cows 2/	Proportion of U.S. cows
	Number	Percent	Number	Percent	Number	Percent	Thousands	Percent
1956--------	1,479,799	7.22	405,090	1.98	21,297	0.10	20,501	9.3
1957--------	1,548,884	7.83	490,001	2.48	79,489	.40	19,774	10.7
1958--------	1,607,538	8.59	549,916	2.94	74,814	.40	18,711	11.9
1959--------	1,746,752	9.76	615,899	3.44	76,392	.43	17,901	13.6
1960--------	1,867,469	10.66	655,885	3.74	70,847	.40	17,515	14.8
1961--------	1,958,355	11.36	698,302	4.05	70,617	.41	17,243	15.8
1962--------	2,006,534	11.91	726,478	4.31	50,492	.30	16,842	16.5
1963--------	2,010,144	12.36	752,229	4.63	60,149	.37	16,260	17.4
1964--------	2,087,581	13.32	818,406	5.22	56,570	.36	15,677	18.9
1965--------	2,058,592	13.77	839,838	5.62	56,957	.38	14,954	19.8
1966--------	2,098,919	14.89	825,127	5.85	53,429	.38	14,093	21.1
1967--------	2,131,929	15.79	847,485	6.28	48,853	.36	13,501	22.4
1968--------	2,138,953	16.41	842,330	6.46	44,131	.34	13,038	23.2
1969 3/-----	2,122,011	16.72	839,343	6.61	47,493	.37	12,689	23.7

1/ Based on succeeding January 1 reports of cows on test in the National Cooperative Dairy Herd Improvement Program.

2/ Average number of milk cows on farms during year, excluding heifers not yet fresh; estimated by the Statistical Reporting Service (USDA).

3/ Also included in the national program for this year are 111,296 cows on other unofficial plans, accounting for an additional 0.9 percentage, which raises the proportion of U.S. cows to 24.6 percent.

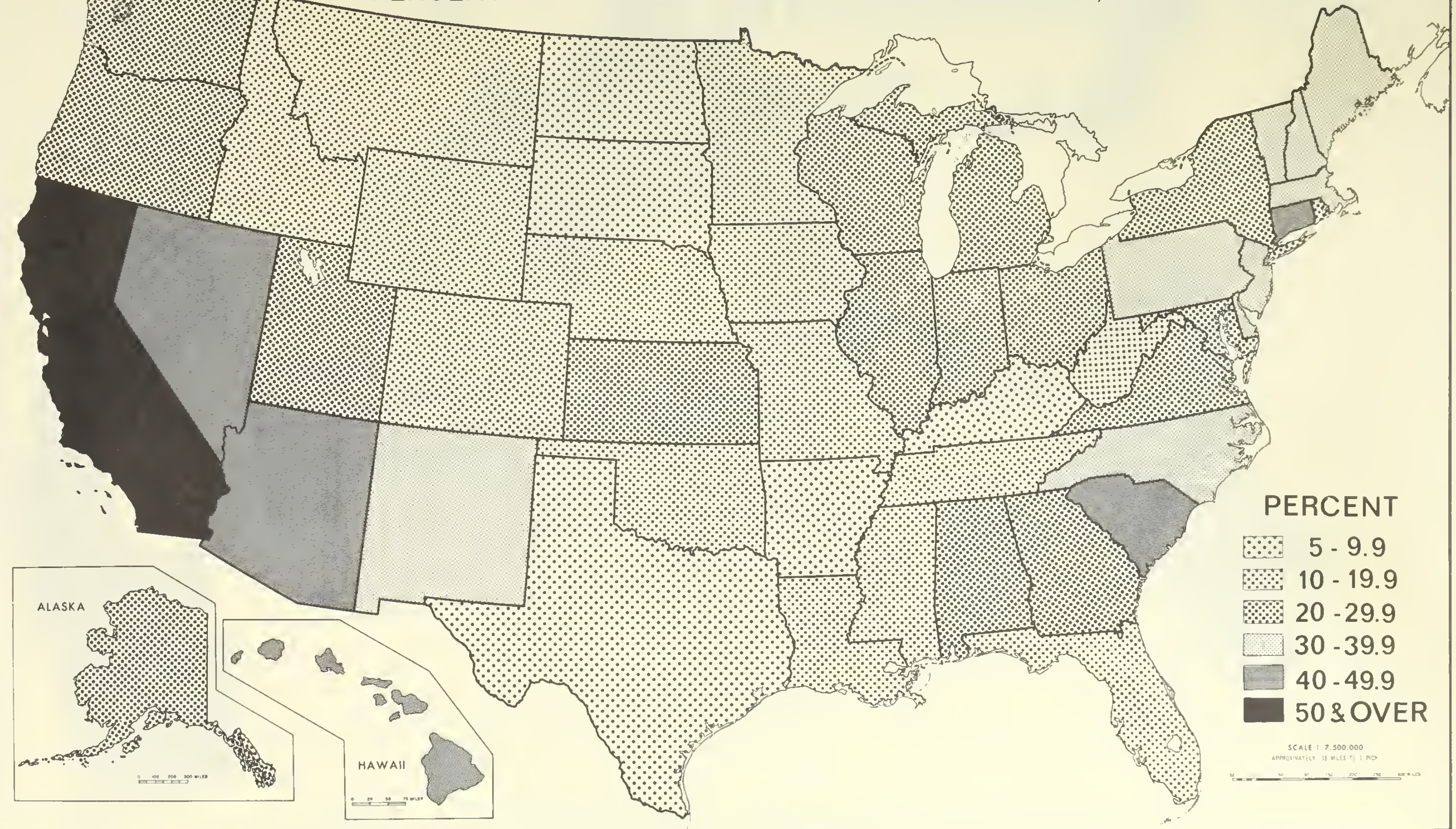
TABLE 13.--Counties, by State, with 40 percent or more cows included in the National Cooperative Dairy Herd Improvement Program--January 1, 1970
(Numerals in parentheses at the end of county listing show the percentage of the States' counties that have 25 percent or more of their cows on test.)

State and county	Cows enrolled in DHIA plans
	Percent
ALABAMA	
Russell	68
Etowah	58
Talladega	58
Elmore	49
Montgomery	48
Cherokee	44
St. Clair	41
(18%)	
ALASKA	
(25%)	
ARIZONA	
Pima	139
Pinal	59
Graham	49
Maricopa	48
Cochise	46
(36%)	
ARKANSAS	
Miller	47
(1%)	
CALIFORNIA	
Alameda	100
Contra Costa	84
Monterey	78
Yolo	77
Madera	75
Marin	75
Tehama	73
Placer	71
Kern	66
Ventura	66
Santa Barbara	63
Fresno	60
San Joaquin	59
San Diego	57
Santa Clara	57
Sonoma	56
Sutter	54
Merced	53
Stanislaus	52
Napa	51
Tulare	51
Sacramento	50
Shasta	50
Riverside	49
San Bernardino	49
Yuba	48
Kings	45
San Luis Obispo	44
Nevada	40
San Mateo	40
(64%)	
COLORADO	
Chaffee	64
Pueblo	63
(8%)	
CONNECTICUT	
Tolland	57
Litchfield	52
Hartford	45
New Haven	43
(88%)	
DELAWARE	
Sussex	45
(67%)	
FLORIDA	
St. Johns	80
Seminole	80
Leon	77
Citrus	73
Indian River	65
Pinellas	62
Gilchrist	61
Jefferson	60
Union	60
Sumter	58
Washington	56
Orange	53
Jackson	46
Manatee	45
(39%)	
GEORGIA	
Dooly	95
Lee	92
Peach	90
Houston	88
Macon	88
Lamar	85
McDuffie	84
Mitchell	79
Newton	79
Jeff Davis	75
Jefferson	72
Jones	71
Worth	69
Clarke	67
Burke	66
Spalding	65
Thomas	62
Clayton	60
Carroll	57
Tift	57
Schley	54
Walton	54
Douglas	50
Stewart	50
Brooks	48
Fayette	48
Butts	46
Tattnall	46
Dougherty	45
Henry	45
Jasper	45
Richmond	42
(28%)	
HAWAII	
Maui	73
Kauai	52
Oahu	46
(80%)	
ILLINOIS	
Monroe	59
Lawrence	53
Piatt	49
Champaign	44
(22%)	
INDIANA	
(7%)	
IOWA	
Dallas	70
Webster	56
Story	44
Lee	41
(29%)	
KANSAS	
Pawnee	77
Harper	56
Wallace	51
Comanche	47
Harvey	47
Saline	46
Logan	45
Meade	42
(25%)	
LOUISIANA	
Richland	64
West Feliciana	55
Morehouse	54
West Carroll	45
(19%)	
MAINE	
Oxford	52
Androscoggin	44
Cumberland	44
(44%)	
MARYLAND	
Dorchester	45
(38%)	
MASSACHUSETTS	
Barnstable	74
Berkshire	42
Hampshire	41
(50%)	
MICHIGAN	
Kalamazoo	55
Barry	55
Calhoun	48
Hillsdale	44
Shiawassee	44
Ingham	43
Missaukee	43
Lenawee	42
Clinton	41
(36%)	
MINNESOTA	
Ramsey	75
(14%)	
MISSISSIPPI	
Washington	70
Coahoma	69
Sunflower	42
(13%)	
MISSOURI	
Callaway	50
Jackson	44
(9%)	
MONTANA	
Lewis and Clark	52
(9%)	
NEBRASKA	
(9%)	
NEVADA	
Clark	92
Douglas	50
(29%)	

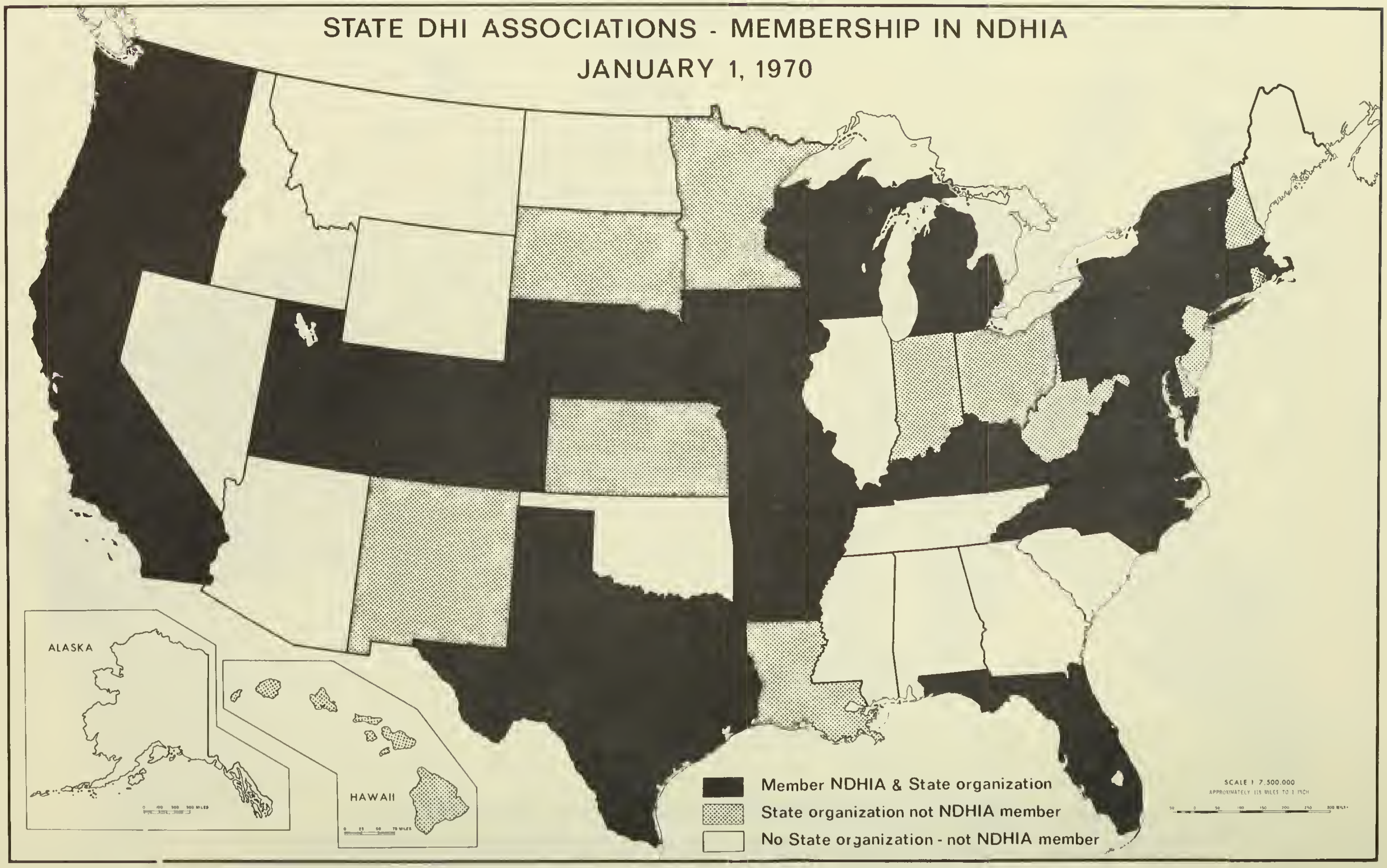
TABLE 13.--Counties, by State, with 40 percent or more cows included in the National Cooperative Dairy Herd Improvement Program--January 1, 1970--Continued

State and county	Cows enrolled in DHIA plans
	Percent
NEW HAMPSHIRE	
Sullivan	54
Hillsborough	41
(80%)	
NEW JERSEY	
Middlesex	59
Burlington	46
(33%)	
NEW MEXICO	
Dona Ana	79
Otero	45
(13%)	
NEW YORK	
Tompkins	54
Columbia	51
Long Island	50
Dutchess	48
Livingston	41
Schuyler	40
(42%)	
NORTH CAROLINA	
New Hanover	100
Richmond	100
Swain	100
Hyde	89
Columbus	73
Robeson	73
Jones	71
Lenoir	71
Wake	69
Beaufort	63
Franklin	63
Johnston	63
Pitt	62
Bladen	61
Warren	61
Brunswick	58
Bertie	57
Caswell	57
Halifax	57
Macon	57
Nash	57
Guilford	55
Chatham	54
Gaston	53
Onslow	51
Hoke	49
Orange	49
Randolph	49
Washington	49
Buncombe	47
Granville	47
Montgomery	47
Pender	46
Craven	45
Durham	44
Person	44
Cherokee	42
Alamance	41
Clay	41
Cumberland	41
Mecklenburg	41
Cleveland	40
(57%)	
OHIO	
Marion	55
Hamilton	48
Lorain	45
OHIO (contd.)	
Wayne	44
Allen	42
Clark	42
Erie	42
Madison	41
Ashland	40
Logan	40
(52%)	
OKLAHOMA	
Atoka	100
Pittsburg	100
Grant	80
Texas	78
Kay	63
Woodward	58
Garfield	53
Noble	47
Osage	44
(29%)	
OREGON	
Josephine	52
Benton	45
Klamath	42
(33%)	
PENNSYLVANIA	
Clinton	58
Blair	47
Lancaster	47
Montgomery	45
Huntingdon	44
Sullivan	43
Mifflin	40
(64%)	
RHODE ISLAND	
(40%)	
SOUTH CAROLINA	
Colleton	100
Jasper	94
Lee	94
Sumter	78
Kershaw	76
Bamberg	75
Calhoun	71
Barnwell	68
Saluda	64
Marlboro	60
Newberry	59
Darlington	58
Orangeburg	57
Hampton	53
Greenville	44
Dorchester	41
Laurens	40
(50%)	
SOUTH DAKOTA	
(4%)	
TENNESSEE	
Dyer	41
(4%)	
TEXAS	
Deaf Smith	75
Starr	65
Willacy	65
Burleson	60
TEXAS (contd.)	
San Patricio	55
Bell	42
Milam	40
(7%)	
UTAH	
Salt Lake	55
Wasatch	48
Davis	43
Summit	43
(38%)	
VERMONT	
Windsor	59
Bennington	54
Washington	49
Addison	41
(71%)	
VIRGINIA	
City of Newport News	100
James City	90
City of Va. Beach	58
Hanover	53
Madison	53
Culpeper	50
Henrico	50
City of Chesapeake	48
Gloucester	47
Nansemond	46
Powhatan	46
Prince George	45
Pulaski	45
Rockingham	45
Spotsylvania	45
Brunswick	44
Nottoway	43
Amelia	42
Augusta	42
Orange	42
Southampton	42
Charlotte	41
Chas. City & New Kent	40
Fauquier	40
Middlesex	40
Northumberland	40
(44%)	
WASHINGTON	
Walla Walla	54
Wahkiakum	47
Pierce	45
Kittitas	40
(49%)	
WEST VIRGINIA	
Mason	40
(4%)	
WISCONSIN	
Kenosha	49
Winnebago	45
Kewaunee	41
Manitowoc	41
Walworth	41
(51%)	
WYOMING	
Albany	82
(4%)	

NATIONAL COOPERATIVE DAIRY HERD IMPROVEMENT PROGRAM
PERCENTAGE OF COWS IN PROGRAM JANUARY 1, 1970



STATE DHI ASSOCIATIONS - MEMBERSHIP IN NDHIA
JANUARY 1, 1970


ALASKA
HAWAII
Member NDHIA & State organization
State organization not NDHIA member
No State organization - not NDHIA member
SCALE 1:7,500,000

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Calif---F. D. Murrill, Extension Service, University of California, Davis 95616.
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Ill-----J. G. Cash, Dairy Science Dept., University of Illinois, Urbana 61803.
Ind-----S. M. Gregory, Dept. of Animal Sciences, Purdue University, Lafayette 47907.
Iowa----D. E. Voelker, Animal & Dairy Science Dept., Iowa State University, Ames 50010.
Kans----E. R. Bonewitz, Dairy Science Dept., Kansas State University, Manhattan 66502.
Ky------E. C. Troutman, Dairy Science Dept., University of Kentucky, Lexington 40506.
La------N. J. Matherne, La. Agr. Extension Service, Louisiana State University, Baton Rouge 70803.
Maine---N. R. Ness, Animal Science Dept., University of Maine, Orono 04473.
Md------C. M. Chance, Dairy Science Dept., University of Maryland, College Park 20742.
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Mich----M. A. Wilson, Dairy Dept., Michigan State University, East Lansing 48823.
Minn----R. W. Wayne, Dairy Husbandry Dept., University of Minnesota, St. Paul 55101.
Miss----G. B. Crain, Dairy Science Dept., Mississippi State University, State College 39762.
Mo------A. G. Lane, Dairy Husbandry Dept., University of Missouri, Columbia 65201.
Mont----B. R. Moss, Dept. of Animal Science & Range Management, Montana State College, Bozeman 59715.
Nebr----P. H. Cole, Animal Science Dept., University of Nebraska, Lincoln 68503.
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N. Y----H. R. Ainslee, Animal Science Dept., Cornell University, Ithaca 14850.
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Oreg----D. E. Anderson, Animal Science Dept., Oregon State University, Corvallis 97331.
Pa------H. C. Gilmore, Dairy Science Dept., Pennsylvania State University, University Park 16802.
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S. C----W. L. Northern, Dairy Science Dept., Clemson University, Clemson 29631.
S. Dak--E. J. Kleen, Dairy Science Dept., South Dakota State University, Brookings 57006.
Tenn----V. D. Parsons, Dairy Dept., University of Tennessee, P. O. Box 1071, Knoxville 37901.
Tex-----J. W. Davis, Jr., Dairy Science Dept., Texas A & M University, College Station 77843.
Utah----J. J. Barnard, Dairy Industry Dept., Utah State University, Logan 84321.
Vt------W. P. Leamy, Animal & Dairy Science Dept., University of Vermont, Burlington 05401.
Va------W. N. Patterson, Dairy Science Dept., Virginia Polytechnic Institute, Blacksburg 24061.
Wash----B. F. Kelso, Animal Sciences Dept., Washington State University, Puyallup 98371.
W. Va---R. O. Kelley, Animal Industry & Veterinary Science Dept., West Virginia University, Morgantown 26506.
Wis-----E. E. Starkey, Dairy Science Dept., University of Wisconsin, Madison 53706.
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National Cooperative Dairy Herd Improvement Program

RECORD BOOK

A plan for every size herd

OFFICIAL DHI OWNER SAMPLER WEIGH-A-DAY-A-MONTH

AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

ARS 44-219
Dairy-Herd-Improvement Letter (Vol. 46, No. 3)

June 1970

NONRETURN RATES OF ARTIFICIAL INSEMINATION (AI) SIRES BY BREEDS IN THE UNITED STATES FOR 1967 AND 1968

by H. D. Norman, B. T. McDaniel, and F. N. Dickinson[1]

Data for dairy bulls used in artificial insemination (AI) in the United States were summarized to determine the average 60- to 90-day nonreturns to first service and to examine the relationship between this commonly used indicator of semen fertility and the number of first services to dairy bulls. The term "60- to 90-day nonreturn" is used to refer to an animal that is not rebred by the same AI organization within a period before 60 to 90 days after the first insemination depending upon when the first insemination was done during the month.

Twenty-one AI organizations in the United States furnished information for 1968 and 22 furnished information for 1967 on both the number of first services and percent of 60- to 90-day nonreturns for individual bulls. They also categorized bulls according to their type of service as (1) regular service, meaning semen was widely and generally available; (2) special request, meaning service was available only

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[1] With the technical assistance of C. A. Rampendahl and J. J. Corbin.

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through special arrangements by dairymen; or (3) in progeny testing, implying distribution was primarily for the purpose of obtaining an evaluation of genetic merit in a large number of herds.

The number of bulls and the total inseminations by breed and type of service, for which nonreturn data were available, are given in table 1 for 1968 and in table 2 for 1967. In 1968, 1,176 bulls accounted for 5,513,304 first services--86 percent of all AI dairy-to-dairy services. In 1967, 1,144 bulls accounted for 5,096,457 first services--81 percent of all AI dairy-to-dairy services.

The average 60- to 90-day nonreturn rates for the first services reported are given by breed and type of service in table 3 for 1968 and table 4 for 1967. The nonreturn rates were averaged both by ignoring the number of services and by weighting the number of services for each bull.

It is evident that the weighted 60- to 90-day nonreturn rates are generally higher than the unweighted rates. This indicates that the bulls higher in semen fertility have more first services than those of lower fertility. The nonreturn rate is increased nearly 1 percent because of this relationship.

The weighted 60- to 90-day nonreturn rates ("effective nonreturn rates") varied from 65 to 75 percent. Among the five prevalent dairy breeds, Jerseys were highest (70.0 and 72.7 percent) and Guernseys were lowest (65.6 and 67.8 percent). The effective nonreturn rate for Holsteins was 69.7 percent in 1967 and increase to 71.4 percent in 1968. The effective nonreturn rate for Brown Swiss and Ayrshire improved only slightly from 1967 to 1968; all averages were between 69.6 and 70.1 percent. Overall the effective nonreturn rate was 1.6 percent higher in 1968 than in 1967.

Confidence intervals were calculated for the unweighted nonreturn rates on the regular service bulls by breeds. Guernsey bulls were significantly lower (99 percent accuracy) than were the Ayrshire, Brown Swiss, Holstein, and Jersey bulls in both years. Jersey bulls were significantly higher

(90 percent accuracy) than were the Ayrshire, Brown Swiss, and Holstein bulls in both years. Part of the differences among breeds in nonreturn rates may be due to different policies on re-breeding cows. However, it seems unlikely that differences as large as those observed would be accounted for by such policies.

The averages for Milking Shorthorns and Red Danes were based on information on four to 20 bulls, and for this reason may not give reliable indications of the nonreturn rates for these breeds. Nevertheless, the weighted average 60- to 90-day nonreturn rates for Milking Shorthorns were high--74.7 percent in 1968 and 75.0 percent in 1967.

The 1968 data in table 3 indicate that the effective 60- to 90-day nonreturn rates for regular-service bulls were from 0.9 to 5.0 percent higher than those for progeny-test bulls in the five breeds with both types. In 1967 (table 4) the progeny-test bulls had higher effective 60- to 90-day nonreturn rates than the regular-service bulls in the Ayrshire, Guernsey, Holstein, and Milking Shorthorn breeds. The reason for the apparent shift in the relative nonreturn rates of regular-service and progeny-test bulls from 1967 to 1968 is unknown. Although nonreturn rates were generally improved for regular-service bulls in 1968, the effective nonreturn rates of progeny-test bulls decreased in all breeds having progeny-test bulls in both years. Possible influences are a change in age at sampling of the progeny-test bulls or a change in the percentage of first services with frozen semen.

With few exceptions the average nonreturn rates were lower for the special-request bulls than for the regular-service bulls. Semen used for the special-request services was probably from old bulls and may have been stored for a longer period than that from the regular-service bulls.

Table 5 shows the grouping of regular-service bulls according to their nonreturn rate. In 1967, 44.9 percent of all regular-service bulls had a 60- to 90-day nonreturn rate greater than 70 percent. In 1968, 55.9 percent of the regular-service bulls were above 70 percent. This favorable increase in nonreturn rate could reflect better management practices in breeding, improved semen preparation, or selection against low fertility bulls.

To justify the use of a bull in regular service with a 60- to 90-day nonreturn rate under 60 percent seems difficult, unless the individual was extremely outstanding in transmitting production. Yet, there were 37 regular-service bulls reported with nonreturn rates below this level in 1968 and 60 in 1967. Of these bulls with low nonreturn rates 16 in 1968 and 23 in 1967 were Guernseys.

Increasing nonreturn rates, thus improving conception rate, has substantial economic benefit within each of the breeds. For this reason bulls having low nonreturn rates should be so identified, giving dairymen some measure of prospects of conception. Dairymen who have the Guernsey breed should be particularly interested in finding those bulls with subnormal fertility and restricting their use in order to maintain calving intervals near optimum (12 to 13 months).

The distribution of special-request bulls grouped by their nonreturn rate is given in table 6. A high proportion of the bulls of this type had 60- to 90-day nonreturns less than 60 percent (21.4 percent in 1967 and 16.6 percent in 1968). Low nonreturn rates may have been a reason for changing bulls from regular to special-request service. In spite of their lower fertility, the special-request bulls probably represent a select group with respect to production or other traits, thus any special storage and handling of semen may be justified.

The distribution of progeny-test bulls with respect to nonreturn rates is given in table 7. It is clear that these young bulls vary substantially in fertility as estimated by nonreturn rate. Although the nonreturn data are based on fewer first services, the percentage of bulls falling in each nonreturn level for the average of both years is similar to that for the regular-service bulls. The percentages of bulls in the various nonreturn categories suggest that some breed differences are present in the progeny-test groups. If nonreturn rates during progeny testing are an indication of future measures of the same, then selection among young bulls could help assure higher nonreturn levels in regular-service bulls.

When cows repeat estrus after one or more services from older bulls,dairymen and inseminators have been known to breed such cows to semen from young bulls, with the hope of improving the chances of conception. From these results, it seems clear that the selection of a service bull for this purpose should be done by considering the individual bull's 60- to 90-day nonreturn rate, and not merely his type of service.

Tables 8 and 9 give 60- to 90-day nonreturn rates according to breed and number of services for bulls in regular service in 1968 and 1967, respectively. These clearly show a relationship between nonreturn rate and the amount of utilization of individual bulls. Any influence that frequency of collecting semen from bulls has upon nonreturn rate is part of such a relationship.

In breeds and years for which one or more regular-service bulls had over 20,000 inseminations, the average nonreturn rates of such bulls were from 2.5 to 6.9 percent higher than the rates for bulls with less than 1,000 services. These same heavily used bulls had rates that were from 1.3 to 5.6 percent higher than those for bulls with 1,000 to 5,000 services.

The more extensive utilization of bulls in AI having high nonreturn rates has undoubtedly been of substantial economic benefit by shortening the interval between consecutive calvings of the cows serviced. It is not known, however, to what extent selection for milk production has been relaxed to improve conception. This can be answered only by considering together the information on nonreturn rate and milk production.

Tables 10 and 11 give the nonreturn rates according to breed and number of services for special-request bulls in 1968 and 1967. These averages are based on a smaller number of bulls but appear to show a pattern similar to that of the regular-service bulls. In 1968 (table 10) the average 60- to 90-day nonreturns for special-request bulls ranged from 5.9 to 12.6 percent higher for bulls with more than 1,000 first services than for bulls with less than 1,000 first services.

Tables 12 and 13 give nonreturn rates by number of services for bulls on progeny testing in 1968 and 1967. It is evident that a positive relationship between 60- to 90-day nonreturn rate and number of services exists within this group, the same as with the other groups. The progeny test bulls having 1,000 to 5,000 services generally had higher average nonreturn rates than those with less than 1,000 services. For the Holsteins weighted and unweighted differences in average 60- to 90-day nonreturns ranged from 0 to 2.6 percent in favor of the more heavily used bulls. Those few progeny-test bulls having more than 5,000 first services were considerably higher in nonreturn rate than those in the lower utilization groups.

A number of factors are apparent from this analysis of 60- to 90-day nonreturn rates of individual AI bulls. There is evidence that breed differences in nonreturn rates do exist. Bulls of the Guernsey breed have lower nonreturn rates than those of most of the other dairy breeds. However, a more complete source of information is needed to determine if differences in nonreturn rates by breeds are genetic or merely represent variation in management practices.

Average 60- to 90-day nonreturns were about the same for regular-service bulls as for progeny-test bulls, indicating dairymen should not expect to reduce calving intervals solely by using progeny-test bulls. Nonreturn rates for special-request bulls were slightly lower than those for bulls in regular service.

Selection of specific bulls based on nonreturn rates has been used to improve conception rates. Heavy use of bulls having high nonreturn rates gave an effective increase in 60- to 90-day nonreturns of about 1 percent in 1967 and 1968.

High levels of herd fertility are helpful in providing short term economic benefits to dairymen and should be considered in efforts to maximize genetic progress for traits such as milk production. Dairymen should continue to give some consideration to nonreturn rates when selecting AI bulls for use in their herd. Information on nonreturn rates should be made more readily available to dairymen, particularly when bulls' nonreturn rates are substantially below breed average.

New ideas are needed in research to find methods of improving levels of fertility through selection, semen preparation, or changes in management practices.

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ERRATUM: For May 1970 Dairy-Herd-Improvement Letter, ARS 44-215, the placement of the maps was reversed. The map on page 19 shows the data in table 2, and the map on page 20 shows the data in table 1.

TABLE 1.--Number of AI bulls and first services, by breed and type of service, 1968
(Bulls for which first services and nonreturn rates were reported)

Breed	Bulls				Services			
	Regular	Special mating	Progeny test	All used	Regular	Special mating	Progeny test	All used
	-------------------------	-------------------------	-------------------------	-------------------------	Number	-------------------------	-------------------------	-------------------------
Ayrshire----	35	--	6	41	54,661	------	1,127	55,788
Guernsey----	111	8	30	149	332,057	4,291	16,957	353,305
Holstein----	523	41	211	775	4,475,027	41,090	145,918	4,662,035
Jersey------	93	8	30	131	266,932	5,248	12,228	284,408
Brown Swiss-	45	2	9	56	124,412	943	5,718	131,073
M.Shorthorn-	19	1	---	20	26,240	207	-------	26,447
Red Dane----	4	--	---	4	248	------	-------	248
Total----	830	60	286	1,176	5,279,577	51,779	181,948	5,513,304

TABLE 2.--Number of AI bulls and first services, by breed and type of service, 1967
(Bulls for which first services and nonreturn rates were reported)

Breed	Bulls				Services			
	Regular	Special mating	Progeny test	All used	Regular	Special mating	Progeny test	All used
	----------	----------	----------	----------	Number	----------	----------	----------
Ayrshire-----	33	1	1	35	63,228	9	139	63,376
Guernsey-----	125	14	35	174	295,841	7,666	54,187	357,694
Holstein-----	517	43	163	723	3,896,110	84,639	272,810	4,253,559
Jersey-------	86	5	29	120	258,102	3,543	17,620	279,265
Brown Swiss--	47	5	15	67	89,529	1,808	21,634	112,971
M.Shorthorn--	17	2	2	21	23,591	645	5,139	29,375
Red Dane-----	4	--	---	4	217	------	-------	217
Total-----	829	70	245	1,144	4,626,618	98,310	371,529	5,096,457

TABLE 3.--Average 60- to 90-day nonreturn rates, in percent, to first service by breed and type of service, 1968 1/

Breed	Service group			Overall
	Regular	Special mating	Progeny test	
	Average unweighted 2/ percent nonreturn rates			
Ayrshire----	70.0	----	66.7	69.5
Guernsey----	66.6	68.8	62.2	65.8
Holstein----	70.5	67.0	68.8	69.9
Jersey------	71.5	69.2	69.9	71.0
Brown Swiss-	70.0	62.9	70.9	69.9
M.Shorthorn-	73.7	68.0	----	73.4
Red Dane----	65.0	----	----	65.0
	Average weighted 3/ percent nonreturn rates			
Ayrshire----	70.2	----	65.2	70.1
Guernsey----	67.9	72.6	64.6	67.8
Holstein----	71.4	70.8	70.5	71.4
Jersey------	72.9	69.5	68.4	72.7
Brown Swiss-	70.2	66.5	68.7	70.1
M.Shorthorn-	74.8	68.0	----	74.7
Red Dane----	65.0	----	----	65.0

1/ Based on 1,176 bulls for which information was available.

2/ All bulls given equal weight regardless of number of services.

3/ Each bull weighted by the number of services. This is the "effective" nonreturn rate.

TABLE 4.--Average 60- to 90-day nonreturn rates, in percent to first service by breed and type of service, 1967 [1]

Breed	Service group			Overall
	Regular	Special mating	Progeny test	
	Average unweighted[2] percent nonreturn rates			
Ayrshire----	67.6	55.0	72.1	67.3
Guernsey----	64.2	63.0	66.0	64.5
Holstein----	69.0	67.1	69.5	69.0
Jersey------	69.9	64.6	66.2	68.8
Brown Swiss-	69.0	68.4	69.9	69.1
M.Shorthorn-	70.7	74.4	71.4	71.1
Red Dane----	74.5	----	----	74.5
	Average weighted[3] percent nonreturn rates			
Ayrshire----	70.0	55.0	72.1	70.0
Guernsey----	65.2	61.3	68.5	65.6
Holstein----	69.7	67.9	70.6	69.7
Jersey------	70.0	64.5	69.8	70.0
Brown Swiss-	69.7	66.5	69.8	69.6
M.Shorthorn-	73.8	74.1	80.8	75.0
Red Dane----	68.5	----	----	68.5

[1] Based on 1,144 bulls for which information was available.

[2] All bulls given equal weight regardless of number of services.

[3] Each bull weighted by number of services. This is the "effective" nonreturn rate.

TABLE 5.--Distribution of AI bulls in regular service according to their 60- to 90-day nonreturn rates, by breed, 1968 and 1967

Year and breed	Percent of bulls in nonreturn rate intervals								AI bulls	
	Unweighted average	<50	50-54.9	55-59.9	60-64.9	65-69.9	70-74.9	≥ 75	No.	Pct.1/
1968										
Ayrshire----	70.0	0	2.9	5.7	14.3	37.1	17.1	22.9	35	85.4
Guernsey----	66.6	1.8	4.5	8.1	20.7	36.9	19.8	8.1	111	74.5
Holstein----	70.5	.4	.6	2.1	9.4	24.9	46.7	16.1	523	67.5
Jersey------	71.5	0	0	0	9.7	31.2	33.3	25.8	93	71.0
Brown Swiss-	70.0	0	0	4.4	11.1	40.0	33.3	11.1	45	80.4
M.Shorthorn-	73.7	0	0	0	0	15.8	42.1	42.1	19	95.0
Red Dane----	65.0	0	0	0	0	100.0	0	0	4	100.0
All breeds-	70.1	.5	1.1	2.9	11.0	28.7	39.3	16.6	830	70.6
1967										
Ayrshire----	67.6	3.0	0	9.1	27.3	27.3	18.2	15.2	33	94.3
Guernsey----	64.2	4.8	2.4	11.2	24.8	40.8	13.6	2.4	125	71.8
Holstein----	69.0	.8	1.0	2.9	11.2	34.4	39.5	10.3	517	71.5
Jersey------	69.9	0	1.2	2.3	9.3	33.7	38.4	15.1	86	71.7
Brown Swiss-	69.0	0	4.3	4.3	12.8	29.8	38.3	10.6	47	70.1
M.Shorthorn-	70.7	5.9	0	0	5.9	17.6	47.1	23.5	17	81.0
Red Dane----	74.5	0	25.0	0	0	0	0	75.0	4	100.0
All breeds-	68.4	1.4	1.4	4.3	13.6	34.3	34.5	10.4	829	72.5

1/ Regular-service AI bulls as a percent of all AI bulls of the breed.

TABLE 6.--Distribution of AI bulls available through special request according to their 60- to 90-day nonreturn rates, by breed, 1968 and 1967

Year and breed	Percent of bulls in nonreturn rate invervals								AI bulls	
	Unweighted average	<50	50-54.9	55-59.9	60-64.9	65-69.9	70-74.9	≥75	No.	Pct.1/
1968										
Ayrshire----	0	0	0	0	0	0	0	0	0	0
Guernsey----	68.8	0	0	12.5	25.0	25.0	12.5	25.0	8	5.4
Holstein----	67.0	0	12.2	4.9	12.2	29.3	29.3	12.2	41	5.3
Jersey------	69.2	0	0	12.5	0	50.0	12.5	25.0	8	6.1
Brown Swiss-	62.9	0	0	50.0	0	50.0	0	0	2	3.6
M.Shorthorn-	68.0	0	0	0	0	100.0	0	0	1	5.0
Red Dane----	0	0	0	0	0	0	0	0	0	0
All breeds-	67.4	0	8.3	8.3	11.7	33.3	23.3	15.0	60	5.1
1967										
Ayrshire----	55.0	0	0	100.0	0	0	0	0	1	2.9
Guernsey----	63.0	7.1	7.1	21.4	21.4	14.3	14.3	14.3	14	8.0
Holstein----	67.1	7.0	7.0	7.0	14.0	25.6	25.6	14.0	43	5.9
Jersey------	64.6	0	0	0	60.0	40.0	0	0	5	4.2
Brown Swiss-	68.4	0	0	0	20.0	40.0	40.0	0	5	7.5
M.Shorthorn-	74.4	0	0	0	0	0	50.0	50.0	2	9.5
Red Dane----	0	0	0	0	0	0	0	0	0	0
All breeds-	66.2	5.7	5.7	10.0	18.6	24.3	22.9	12.9	70	6.1

1/ Special-request AI bulls as a percent of all AI bulls of the breed.

TABLE 7.--Distribution of AI bulls on progeny testing according to their 60- to 90-day nonreturn rates, by breed, 1968 and 1967

Year and breed	Percent of bulls in nonreturn rate intervals								AI bulls	
	Unweighted average	<50	50-54.9	55-59.9	60-64.9	65-69.9	70-74.9	≥75	No.	Pct. 1/
1968										
Ayrshire----	66.7	0	0	16.7	16.7	50.0	0	16.7	6	14.6
Guernsey----	62.2	13.3	0	13.3	20.0	26.7	20.0	6.7	30	20.1
Holstein----	68.8	.5	1.9	5.2	12.8	35.5	30.3	13.7	211	27.2
Jersey------	69.9	3.3	3.3	0	10.0	36.7	26.7	20.0	30	22.9
Brown Swiss-	70.9	0	0	0	11.1	44.4	22.2	22.2	9	16.1
M.Shorthorn-	0	0	0	0	0	0	0	0	0	0
Red Dane----	0	0	0	0	0	0	0	0	0	0
All breeds-	68.2	2.1	1.7	5.6	13.3	35.3	28.0	14.0	286	24.3
1967										
Ayrshire----	72.1	0	0	0	0	0	100.0	0	1	2.9
Guernsey----	66.0	2.9	0	5.7	25.7	42.9	17.1	5.7	35	20.1
Holstein----	69.5	.6	1.8	4.3	13.5	26.4	38.0	15.3	163	22.5
Jersey------	66.2	3.4	10.3	0	13.8	41.4	17.2	13.8	29	24.2
Brown Swiss-	69.9	0	0	0	13.3	40.0	33.3	13.3	15	22.4
M.Shorthorn-	71.4	0	0	0	50.0	0	0	50.0	2	9.5
Red Dane----	0	0	0	0	0	0	0	0	0	0
All breeds-	68.7	1.2	2.4	3.7	15.5	31.0	32.2	13.9	245	21.4

1/ Progeny-test AI bulls as a percent of all AI bulls of the breed.

TABLE 8.--Average 60- to 90-day nonreturn rates, in percent, for bulls in regular service, by breed and inseminations per bull, 1968

Breed	Nonreturn rates per bull grouped by number of services per bull				
	1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999	20,000 and over
	Average unweighted[1] percent nonreturn rates				
Ayrshire----	68.8	71.3	65.0	----	----
Guernsey----	66.1	66.0	69.6	68.3	70.0
Holstein----	69.2	70.3	70.6	71.4	71.7
Jersey------	70.6	71.4	72.1	75.6	----
Brown Swiss-	70.8	69.5	67.4	72.0	75.0
M.Shorthorn-	72.8	74.3	----	----	----
Red Dane----	65.0	----	----	----	----
	Average weighted[2] percent nonreturn rates				
Ayrshire----	65.2	71.8	65.0	----	----
Guernsey----	63.2	66.7	69.5	68.6	70.0
Holstein----	68.0	70.7	70.7	71.5	72.0
Jersey------	71.8	72.0	72.3	75.1	----
Brown Swiss-	68.1	69.4	67.5	72.0	75.0
M.Shorthorn-	74.4	74.8	----	----	----
Red Dane----	65.0	----	----	----	----
	Number of bulls				
Ayrshire----	15	19	1	--	--
Guernsey----	41	51	12	6	1
Holstein----	87	159	122	98	57
Jersey------	36	39	12	6	--
Brown Swiss-	20	18	5	1	1
M.Shorthorn-	8	11	--	--	--
Red Dane----	4	--	--	--	--

[1] All bulls given equal weight regardless of number of services.

[2] Each bull weighted by the number of services. This is the "effective" nonreturn rate.

TABLE 9.--Average 60- to 90-day nonreturn rates, in percent, for bulls in regular service, by breed and inseminations per bull, 1967

Breed	Nonreturn rates per bull grouped by number of services per bull: 1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999	20,000 and over
	Average unweighted[1] percent nonreturn rates				
Ayrshire----	63.6	69.4	71.1	----	----
Guernsey----	63.3	64.9	65.3	65.0	----
Holstein----	67.4	68.9	69.3	69.8	70.2
Jersey------	70.5	69.1	70.1	72.9	----
Brown Swiss-	68.7	68.9	70.5	----	----
M.Shorthorn-	65.7	74.2	----	----	----
Red Dane----	74.5	----	----	----	----
	Average weighted[2] percent nonreturn rates				
Ayrshire----	65.7	70.3	70.3	----	----
Guernsey----	62.7	65.6	65.5	65.0	----
Holstein----	67.1	68.8	69.4	69.8	70.3
Jersey------	70.1	68.4	70.1	72.8	----
Brown Swiss-	68.6	69.4	70.4	----	----
M.Shorthorn-	72.1	74.1	----	----	----
Red Dane----	68.5	----	----	----	----
	Number of bulls				
Ayrshire----	11	20	2	--	--
Guernsey----	60	48	13	4	--
Holstein----	90	154	128	106	39
Jersey------	30	38	15	3	--
Brown Swiss-	20	23	4	--	--
M.Shorthorn-	7	10	--	--	--
Red Dane----	4	--	--	--	--

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[1] All bulls given equal weight regardless of number of services.

[2] Each bull weighted by the number of services. This is the "effective" nonreturn rate.

TABLE 10.--Average 60- to 90-day nonreturn rates, in percent, for bulls available through special request, by breed and inseminations per bull, 1968

Breed	Nonreturn rates per bull grouped by number of services per bull		
	1 to 999	1,000 to 4,999	5,000 to 9,999
	Average unweighted[1] percent nonreturn rates		
Ayrshire----	----	----	----
Guernsey----	66.9	74.5	----
Holstein----	64.8	72.2	72.0
Jersey------	68.1	77.0	----
Brown Swiss-	62.9	----	----
M.Shorthorn-	68.0	----	----
Red Dane----	----	----	----
	Average weighted[2] percent nonreturn rates		
Ayrshire----	----	----	----
Guernsey----	65.8	74.5	----
Holstein----	66.1	72.0	72.0
Jersey------	64.4	77.0	----
Brown Swiss-	66.5	----	----
M.Shorthorn-	68.0	----	----
Red Dane----	----	----	----
	Number of bulls		
Ayrshire----	--	--	--
Guernsey----	6	2	--
Holstein----	29	10	2
Jersey------	7	1	--
Brown Swiss-	2	--	--
M.Shorthorn-	1	--	--
Red Dane----	--	--	--

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[1] All bulls given equal weight regardless of number of services.

[2] Each bull weighted by the number of services. This is the "effective" nonreturn rate.

TABLE 11.--Average 60- to 90-day nonreturn rates, in percent, for bulls available through special request, by breed and inseminations per bull, 1967

Breed	Nonreturn rates per bull grouped by number of services per bull			
	1 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 19,999
	Average unweighted[1] percent nonreturn rates			
Ayrshire----	55.0	----	----	----
Guernsey----	63.0	63.0	----	----
Holstein----	66.9	66.4	70.3	65.6
Jersey------	64.3	65.0	----	----
Brown Swiss-	69.5	64.1	----	----
M.Shorthorn-	74.4	----	----	----
Red Dane----	----	----	----	----
	Average weighted[2] percent nonreturn rates			
Ayrshire----	55.0	----	----	----
Guernsey----	62.2	60.7	----	----
Holstein----	65.7	66.8	70.3	65.6
Jersey------	63.7	64.8	----	----
Brown Swiss-	70.1	64.1	----	----
M.Shorthorn-	74.1	----	----	----
Red Dane----	----	----	----	----
	Number of bulls			
Ayrshire----	1	--	--	--
Guernsey----	11	3	--	--
Holstein----	23	14	5	1
Jersey------	3	2	--	--
Brown Swiss-	4	1	--	--
M.Shorthorn-	2	--	--	--
Red Dane----	--	--	--	--

[1] All bulls given equal weight regardless of number of services.

[2] Each bull weighted by the number of services. This is the "effective" nonreturn rate.

TABLE 12.--Average 60- to 90-day nonreturn rates, in percent, for bulls on progeny testing, by breed and inseminations per bull, 1968

Breed	Nonreturn rates per bull grouped by number of services per bull		
	1 to 999	1,000 to 4,999	5,000 to 9,999
	Average unweighted[1/] percent nonreturn rates		
Ayrshire----	66.7	----	----
Guernsey----	61.5	66.9	----
Holstein----	68.2	70.8	83.0
Jersey------	70.1	68.5	----
Brown Swiss-	71.4	67.0	----
M.Shorthorn-	----	----	----
Red Dane----	----	----	----
	Average weighted[2/] percent nonreturn rates		
Ayrshire----	65.2	----	----
Guernsey----	63.3	65.9	----
Holstein----	68.7	70.9	83.0
Jersey------	68.3	68.5	----
Brown Swiss-	69.3	67.0	----
M.Shorthorn-	----	----	----
Red Dane----	----	----	----
	Number of bulls		
Ayrshire----	6	--	--
Guernsey----	26	4	--
Holstein----	165	45	1
Jersey------	26	4	--
Brown Swiss-	8	1	--
M.Shorthorn-	--	--	--
Red Dane----	--	--	--

[1/] All bulls given equal weight regardless of number of services.

[2/] Each bull weighted by the number of services. This is the "effective" nonreturn rate.

TABLE 13.--Average 60- to 90-day nonreturn rates, in percent, for bulls on progeny testing, by breed and inseminations per bull, 1967

Breed	Nonreturn rates per bull grouped by number of services per bull		
	1 to 999	1,000 to 4,999	5,000 to 9,999
	Average unweighted[1] percent nonreturn rates		
Ayrshire----	72.1	----	----
Guernsey----	64.5	67.5	69.8
Holstein----	69.1	69.5	72.1
Jersey------	65.6	69.1	----
Brown Swiss-	69.6	70.3	71.1
M.Shorthorn-	61.8	----	81.0
Red Dane----	----	----	----
	Average weighted[2] percent nonreturn rates		
Ayrshire----	72.1	----	----
Guernsey----	65.9	68.7	69.8
Holstein----	69.5	69.5	72.1
Jersey------	67.6	71.3	----
Brown Swiss-	68.5	69.6	71.1
M.Shorthorn-	61.8	----	81.0
Red Dane----	----	----	----
	Number of bulls		
Ayrshire----	1	--	--
Guernsey----	18	16	1
Holstein----	95	51	17
Jersey------	24	5	--
Brown Swiss-	10	4	1
M.Shorthorn-	1	--	1
Red Dane----	--	--	--

1/ All bulls given equal weight regardless of number of services.

2/ Each bull weighted by the number of services. This is the "effective" nonreturn rate.

National Cooperative Dairy Herd Improvement Program
RECORD BOOK
A plan for every size herd
OFFICIAL DHI OWNER SAMPLER WEIGH-A-DAY-A-MONTH
AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

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ARTIFICIAL BREEDING REPORT, 1969[1]

Data for the artificial breeding report are based on information received from artificial breeding studs, the National Association of Animal Breeders, State Extension Dairymen, and private breeders. A reported 8,209,444 dairy and beef females were bred artificially in 1969. This was 14.6 percent of the total females of breeding age, based on estimated totals of 16,209,000 dairy females and 39,951,000 beef females. Of the females bred artificially, 7,285,063 were dairy and 924,381 were beef. The respective percentages of dairy and beef were 44.9 and 2.3. These data represent an increase of 146,427 dairy cows or 2.1 percent and 129,139 beef cows, or 16 percent over 1968.

As in previous years, the data in the report are based partially on estimations. For example, in cases where the only records available were for ampules of semen sold, the number of first services was estimated to be one-half the number of ampules reported. In addition, the data represent the minimum number of cows bred artificially. This is because figures on a small percentage of artificial

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[1] Prepared by G. J. King, B. T. McDaniel, F. N. Dickinson, C. A. Rampendahl, J. J. Corbin, and A. H. Kienast.

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breedings (by small custom-freezing organizations and individuals) were not available to USDA.

Dairy bulls bred 6,590,147 cows. These are presumed to be dairy, but some dairy services to beef cows are probably included. Beef bulls bred 924,381 beef cows and 694,916 dairy cows--a total of 1,619,297. Compared to 1968, dairy-to-dairy breeding was up 166,361 or 2.6 percent; beef-to-beef breeding was up 129,139 or 16 percent; and beef-to-dairy, down 19,934 or 2.8 percent.

Table 1 lists the percentage of U.S. dairy cows and heifers bred artificially, by States, in 1969. These figures show Hawaii leading with 93.6 percent, Florida second with 75.2 percent, and Utah and Connecticut between 60 and 70 percent. There are nine States between 50 and 59.9 percent, 14 States between 40 and 49.9 percent, nine States between 30 and 39.9 percent, 11 States between 20 and 29.9 percent, and three States below 20 percent. These percentages are also presented graphically on the map on page 17.

Table 2 shows the breedings to dairy and beef bulls by State or other source in 1969. 'Other source' includes 52,612 cows bred by various groups and not reported by the States of service and some beef-to-beef breeding reported only by the National Association of Animal Breeders.

The national and State percentages of cows and heifers bred artificially are shown for dairy in table 3 and for beef in table 4. Traditionally, these percentages have been based on the number of cows 2 years old and older. This year percentages were also calculated based on the total number of dairy and beef females presumed to be of breeding age. We believe that the proper number for comparison is the number of cows 2 years old and older on farms January 1, 1969, plus a percentage of 1- to 2-year-old heifers on January 1, 1969, if 1969 breedings are desired. Seventeen months is about the average age of first breeding of dairy heifers. Thus, seven-twelfths, or 58.3 percent of the number of younger heifers was added to the cows 2 years old and older as the number to base the 1969 artificial breeding percentages on.

The percentages for dairy cows, based on U.S. cows 2 years old and older as well as on all cows and heifers of breeding age are given in table 3. Of the larger population, 44.9 percent were bred artificially in 1969. Similar data for beef cattle breeding are shown in table 4. Information obtained from beef cattle specialists indicates that about 40 percent of the beef heifers 1 to 2 years of age are bred annually. Table 4 shows that about 2.3 percent of the Nation' beef cows and heifers were bred artificially in 1969.

Table 5 contains the recalculated percentages of the national dairy herd of cows and heifers that were artificially bred for 1963 through 1969. The recalculation was made from the first year USDA received complete breakdowns of dairy-to-dairy breeding; beef-to-dairy breeding; and beef-to-beef breeding. The new values are shown as the bottom curve in figure 1.

Table 6 shows the top 10 States in number and percentage of dairy and beef cows bred artificially. Wisconsin had the highest number--1,348,308, and Hawaii, the highest percentage--93.6, of dairy cows bred. Texas had the highest number--66,865, and Rhode Island, the highest percentage--13.0, of beef cows bred.

Table 7 shows the scope of artificial breeding by State for 1968 and 1969. The greatest increase in number of dairy cows bred--89,151--occurred in California; the greatest increase in beef cows bred--26,290--occurred in Texas. Twenty-seven States increased in dairy cows bred artificially and 32 States increased in numbers of beef cows bred artificially.

Table 8 gives the history of the artificial breeding census since 1939. The continual upward trend from 7,359 in 1939 to 8,209,444 in 1969 is illustrated in figures 1 and 2. The percentages of dairy cattle bred are shown in figure 1, and the numbers of beef cattle bred since reporting began in 1963 are shown in figure 2.

Table 9 shows that 31 organizations bred cows artificially in 1969. These organizations serviced an estimated

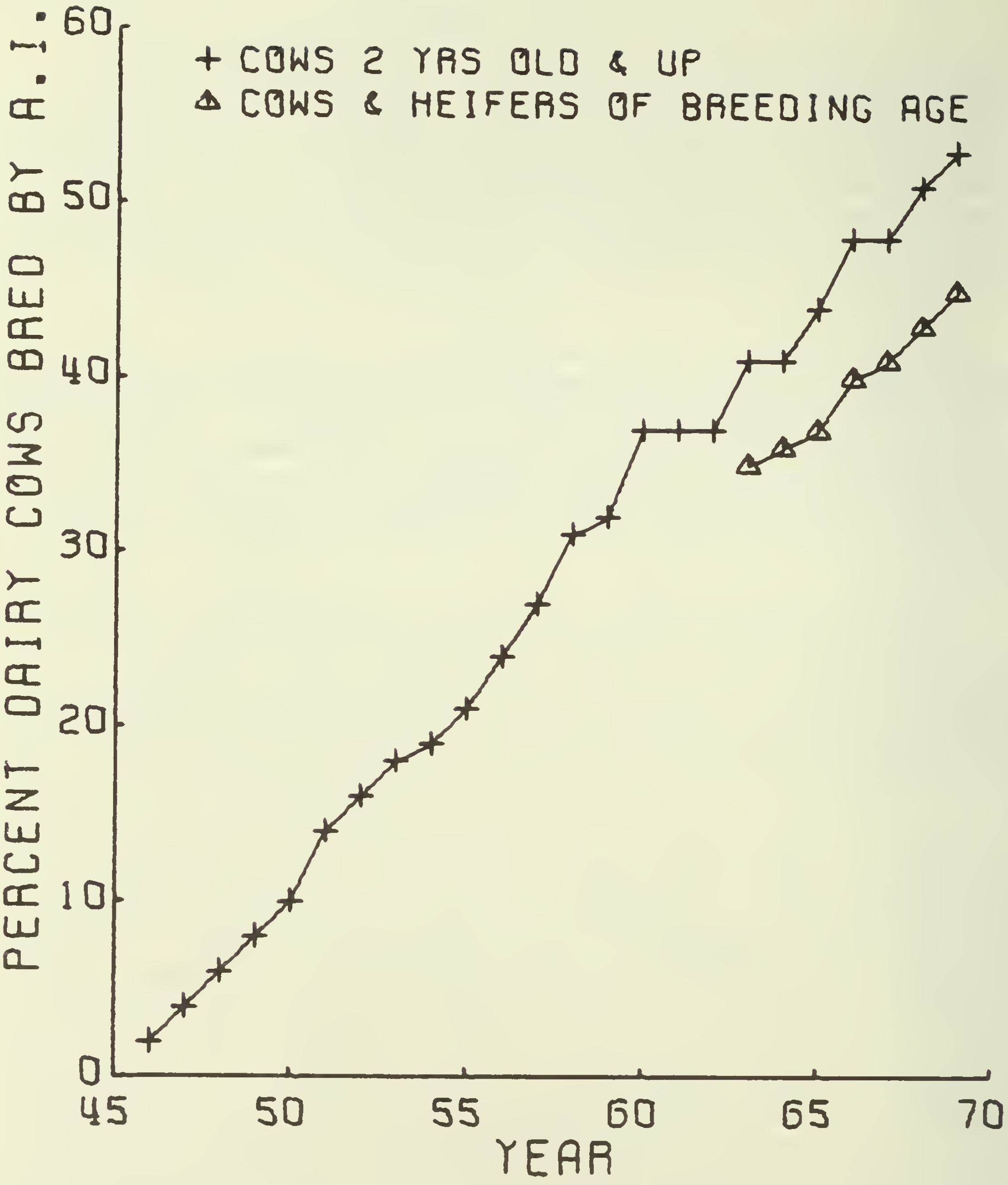

FIGURE 1.--Yearly trends in the percentage of U.S. dairy cows bred artificially since 1946.

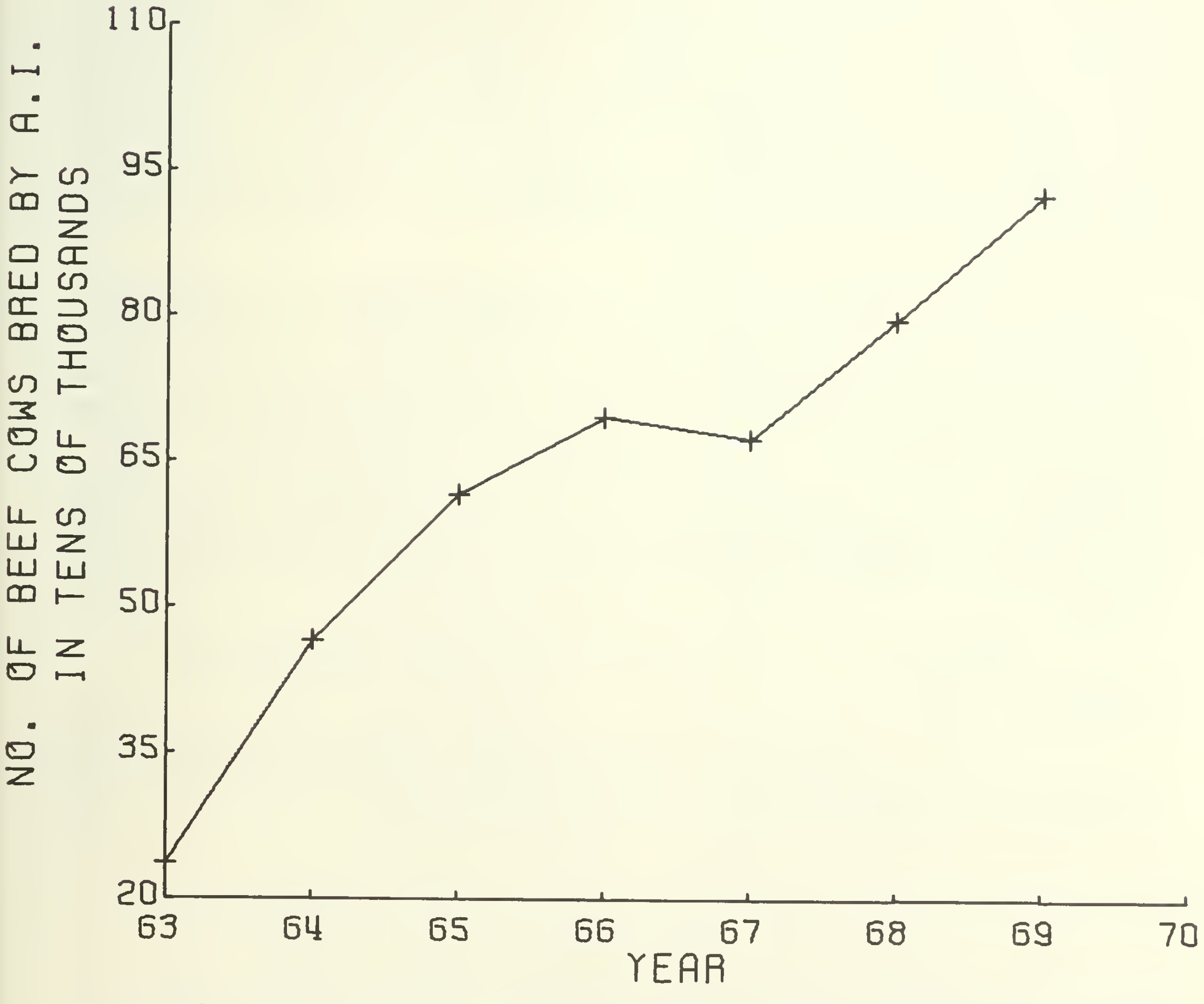

FIGURE 2.--Yearly trends in the number of U.S. beef cows bred artificially since 1963

387,979 herds. However, it is possible that some herds may have been counted more than once when two or more artificial insemination (AI) studs bred cows in the same herd. In addition to the 7,521,890 cows bred by technicians hired by the studs, about 595,055 cows were bred by semen sold to individual farmers, and 92,499 cows were bred by custom-frozen semen.

Two AI organizations reported that they artificially bred 3,230 swine, a decrease of 6,382 from 1968. Services to 235 goats were reported, also a decrease from 1968.

Table 10 shows that a total of 2,275 dairy and beef bulls were in AI studs in 1969. This probably exceeds the number of bulls actually used to breed cows in 1969, because it includes all bulls reported in studs at any time during the year. It was possible to remove bulls without services from the counts only when the stud reported an actual or estimated number of services by each bull. There was a decrease of 70 bulls from 1968.

The distribution of 1,911 dairy bulls by type of service and breed is also shown in table 10. Fifty-three percent of the dairy bulls were available in regular service, 40 percent were involved in progeny testing only, and 7 percent were available only on a special-service basis. The number of bulls in regular service dropped from 1968, while the bulls in progeny testing increased by 49, and those held for special mating increased by 10. Most of the 364 beef bulls were reported as in regular service.

Table 11 lists artificial-breeding organizations active in 1969.

A list of Extension Dairymen in charge of dairy cattle breeding in each State is given on page 18.

TABLE 1.--Percentage of U.S. dairy cows and heifers bred artificially, by States, in 1969 1/

State	Rank	State	Rank
	Percent		Percent
Hawaii	93.6	South Carolina	43.1
Florida	75.2	Illinois	41.2
Utah	68.5	Idaho	39.7
Connecticut	63.7	North Carolina	39.3
Pennsylvania	59.4	Georgia	37.9
Washington	57.2	Kansas	37.3
California	56.2	Colorado	35.8
New York	55.9	Indiana	35.3
Wisconsin	55.8	Nevada	34.7
Massachusetts	52.8	Louisiana	32.1
New Jersey	52.6	West Virginia	30.4
Vermont	51.0	Iowa	29.2
Ohio	50.7	Alabama	28.4
Maine	49.8	Kentucky	26.3
New Hampshire	49.2	Missouri	26.2
Oregon	48.5	Wyoming	26.0
Alaska	48.1	Texas	25.9
Michigan	48.0	Mississippi	23.8
Arizona	47.9	Tennessee	23.5
Delaware	47.8	Montana	22.8
New Mexico	45.3	Nebraska	20.8
Minnesota	44.4	Arkansas	20.4
Rhode Island	44.3	Oklahoma	16.2
Maryland	44.1	North Dakota	13.0
Virginia	44.1	South Dakota	12.7
		United States	44.9

1/ From Statistical Reporting Service (USDA) estimations. Percentage based on U.S. (dairy) cows and heifers 2 years old and older kept for milk plus 58.3 percent of heifers 1-2 years old. (Assuming that average age of first breeding is 17 months.)

TABLE 2.--Cows and heifers bred artificially to dairy and beef bulls in the United States in 1969

State or other source	Studs	Bred to dairy bulls in 1969		Bred to beef bulls in 1969	
		Registered dairy cows 1/	Total dairy cows	Dairy cows	Beef cows
	Number				
Alabama---------	0	5,426	45,391	5,486	7,400
Alaska----------	1	110	957	54	20
Arizona---------	0	2,770	27,572	1,674	4,077
Arkansas--------	0	2,864	21,367	3,532	8,052
California------	3	67,942	524,673	26,123	20,084
Colorado--------	0	4,494	42,552	3,309	12,104
Connecticut-----	1	10,698	48,860	5,314	184
Delaware--------	0	2,676	7,578	1,026	100
Florida---------	0	13,510	140,505	15,938	17,865
Georgia---------	0	9,880	61,054	4,861	7,670
Hawaii----------	0	2,418	15,906	------	295
Idaho-----------	0	8,890	72,829	7,845	8,549
Illinois--------	1	30,496	152,770	17,865	15,058
Indiana---------	0	17,739	101,401	9,752	15,900
Iowa------------	0	20,279	181,771	22,444	40,459
Kansas----------	1	8,152	91,075	6,031	53,424
Kentucky--------	0	13,311	102,849	16,350	20,902
Louisiana-------	1	9,630	63,873	8,088	21,182
Maine-----------	0	8,337	41,481	3,816	105
Maryland--------	1	12,211	85,481	5,786	3,926
Massachusetts---	0	9,721	38,970	5,356	327
Michigan--------	2	38,933	257,537	25,456	9,288
Minnesota-------	1	45,429	533,062	58,634	27,918
Mississippi-----	1	7,739	60,532	3,643	10,245
Missouri--------	0	16,289	115,304	8,645	34,938
Montana---------	0	1,259	11,161	1,380	52,109
Nebraska--------	0	5,634	45,722	5,780	26,456
Nevada----------	0	851	6,076	175	1,862
New Hampshire---	0	5,059	21,863	2,731	80
New Jersey------	0	10,986	42,708	5,191	502
New Mexico------	0	1,746	19,531	385	3,590
New York--------	1	126,758	655,716	65,577	3,349
North Carolina--	1	15,458	85,754	9,849	11,116
North Dakota----	0	1,918	22,393	1,731	20,506
Ohio------------	2	45,867	256,450	34,938	33,555
Oklahoma--------	0	3,665	29,390	1,595	14,598
Oregon----------	0	7,136	60,787	7,049	10,744
Pennsylvania----	2	132,969	493,269	66,498	11,244
Puerto Rico-----	1	10,407	72,624	------	------
Rhode Island----	0	895	3,592	397	130
South Carolina--	0	4,162	32,499	4,144	2,666
South Dakota----	0	2,882	26,269	3,793	29,855
Tennessee-------	3	9,180	82,633	10,571	18,704
Texas-----------	0	7,594	99,852	9,328	66,865
Utah------------	1	6,712	59,913	5,832	12,851
Vermont---------	0	22,183	121,838	11,746	485
Virginia--------	1	14,296	116,398	11,030	7,343
Washington------	2	15,183	119,334	12,226	11,325
West Virginia---	0	3,107	21,275	2,759	3,021
Wisconsin-------	4	114,024	1,198,020	150,288	30,279
Wyoming---------	0	732	5,188	522	15,068
Reported AI activity, but State unknown 2/	-	490	44,542	2,373	5,697
All beef services 3/ -----	-	------	-------	------	190,309
United States---	31	941,097	6,590,147	694,916	924,381

1/ Data for registered cows may have been all or partially estimated when incomplete report was given.

2/ AI breeding activity reported for: Curtiss, 3,000 cows; Herdsman, 28,406 cows; Kansas ABS Unit, 1,060 cows; Midwest Breeders, 684 cows; NOBA, 16,347 cows; Virginia ABA, 3,115 cows. Total: 52,612 cows. Data were received from studs.

3/ Information obtained from National Association of Animal Breeders, P.O. Box 1033, Columbia, Missouri 65201. See table 9 for data.

TABLE 3.--Percentage of U.S. dairy cows and heifers bred artificially in 1969

tate or ther source	Dairy cows bred to dairy and beef bulls in 1969	U.S. dairy cows and heifers 1-1-70 1/	Dairy cows and heifers bred	U.S. dairy cows and heifers of breeding age 1-1-69 2/3/	Dairy cows and heifers bred
	Number	Thousands	Percent	Thousands	Percent
labama---------	50,877	151	33.7	179	28.4
laska----------	1,011	1.9	53.2	2.1	48.1
rizona---------	29,246	54	54.2	61	47.9
rkansas--------	24,899	106	23.5	122	20.4
alifornia------	550,796	840	65.6	980	56.2
olorado--------	45,861	112	40.9	128	35.8
onnecticut-----	54,174	74	73.2	85	63.7
elaware--------	8,604	16	53.8	18	47.8
lorida---------	156,443	199	78.6	208	75.2
eorgia---------	65,915	152	43.4	174	37.9
awaii----------	15,906	15	106.0	17	93.6
daho-----------	80,674	169	47.7	203	39.7
llinois--------	170,635	359	47.5	414	41.2
ndiana---------	111,153	270	41.2	315	35.3
owa------------	204,215	568	36.0	700	29.2
ansas----------	97,106	224	43.4	260	37.3
entucky--------	119,199	388	30.7	454	26.3
ouisiana-------	71,961	196	36.7	224	32.1
aine-----------	45,297	77	58.8	91	49.8
aryland--------	91,267	182	50.1	207	44.1
assachusetts---	44,326	72	61.6	84	52.8
ichigan--------	282,993	509	55.6	590	48.0
innesota-------	591,696	1,089	54.3	1,333	44.4
ississippi-----	64,175	224	28.6	270	23.8
issouri--------	123,949	400	31.0	473	26.2
ontana---------	12,541	47	26.7	55	22.8
ebraska--------	51,502	211	24.4	248	20.8
evada----------	6,251	15	41.7	18	34.7
ew Hampshire---	24,594	43	57.2	50	49.2
ew Jersey------	47,899	80	59.9	91	52.6
ew Mexico------	19,916	39	51.1	44	45.3
ew York--------	721,293	1,127	64.0	1,290	55.9
orth Carolina--	95,603	207	46.2	243	39.3
orth Dakota----	24,124	163	14.8	186	13.0
hio------------	291,388	493	59.1	575	50.7
klahoma--------	30,985	161	19.2	191	16.2
regon----------	67,836	118	57.5	140	48.5
ennsylvania----	559,767	807	69.4	943	59.4
uerto Rico-----	72,624	-----	----	-----	----
hode Island----	3,989	8	49.9	9	44.3
outh Carolina--	36,643	74	49.5	85	43.1
outh Dakota----	30,062	200	15.0	237	12.7
ennessee-------	93,204	345	27.0	397	23.5
exas-----------	109,180	381	28.7	422	25.9
tah------------	65,745	82	80.2	96	68.5
ermont---------	133,584	230	58.1	262	51.0
irginia--------	127,428	245	52.0	289	44.1
ashington------	131,560	200	65.8	230	57.2
est Virginia---	24,034	69	34.8	79	30.4
isconsin-------	1,348,308	2,062	65.4	2,415	55.8
yoming---------	5,710	20	28.6	22	26.0
eported AI activity, but State unknown 4/	46,915	-----	----	-----	----
nited States---	7,285,063	13,875	52.5	16,209	44.9

1/ U.S. cows and heifers 2 years old and older kept for milk, January 1, 1970. Estimated by Statistical Reporting Service (USDA). ata are preliminary.

2/ U.S. cows and heifers 2 years old and older kept for milk, January 1, 1969, plus 58.3 percent of heifers 1-2 years old kept for ilk, January 1, 1969. Estimated by Statistical Reporting Service (USDA).

3/ Dairy cattle on farms, January 1, 1969, are those available for breeding in 1969; 58.3 percent of 1-2 year old heifers were dded as the percentage of those coming to breeding age in 1969 that were bred in 1969, assuming that the average age of first breeding is 7 months.

4/ See table 2, footnote 2, for source of data.

TABLE 4.--Percentage of U.S. beef cows and heifers bred artificially in 1969

State or other source	Beef cows bred to beef bulls in 1969	U.S. beef cows January 1, 1970 1/	Beef cows bred	U.S. beef cows and heifers of breeding age 1969 2/3/	Beef cows and heifers bred
	Number	Thousands	Percent	Thousands	Percent
Alabama--------	7,400	929	0.8	980	0.8
Alaska---------	20	2.4	.8	2.8	.7
Arizona--------	4,077	376	1.1	399	1.0
Arkansas-------	8,052	939	.9	949	.8
California-----	20,084	946	2.1	1,113	1.8
Colorado-------	12,104	1,082	1.1	1,180	1.0
Connecticut----	184	4	4.6	4	4.6
Delaware-------	100	5	2.0	6	1.7
Florida--------	17,865	909	2.0	958	1.9
Georgia--------	7,670	830	.9	893	.9
Hawaii---------	295	92	.3	102	.3
Idaho----------	8,549	588	1.5	622	1.4
Illinois-------	15,058	744	2.0	902	1.7
Indiana--------	15,900	439	3.6	510	3.1
Iowa-----------	40,459	1,443	2.8	1,658	2.4
Kansas---------	53,424	1,839	2.9	1,949	2.7
Kentucky-------	20,902	1,087	1.9	1,099	1.9
Louisiana------	21,182	903	2.3	964	2.2
Maine----------	105	9	1.2	10	1.1
Maryland-------	3,926	58	6.8	63	6.2
Massachusetts--	327	4	8.2	5	6.5
Michigan-------	9,288	123	7.6	146	6.4
Minnesota------	27,918	545	5.1	618	4.5
Mississippi----	10,245	1,273	.8	1,319	.8
Missouri-------	34,938	1,929	1.8	1,943	1.8
Montana--------	52,109	1,589	3.3	1,676	3.1
Nebraska-------	26,456	1,888	1.4	2,195	1.2
Nevada---------	1,862	336	.6	350	.5
New Hampshire--	80	2	4.0	2	4.0
New Jersey-----	502	8	6.3	10	5.0
New Mexico-----	3,590	708	.5	744	.5
New York-------	3,349	62	5.4	66	5.1
North Carolina-	11,116	371	3.0	375	3.0
North Dakota---	20,506	964	2.1	1,005	2.0
Ohio-----------	33,555	360	9.3	377	8.9
Oklahoma-------	14,598	2,174	.7	2,232	.7
Oregon---------	10,744	685	1.6	727	1.5
Pennsylvania---	11,244	100	11.2	117	9.6
Puerto Rico----	------	-----	----	-----	----
Rhode Island---	130	1	13.0	1	13.0
South Carolina-	2,666	266	1.0	279	1.0
South Dakota---	29,855	1,719	1.7	1,842	1.6
Tennessee------	18,704	954	2.0	1,006	1.9
Texas----------	66,865	5,737	1.2	5,990	1.1
Utah-----------	12,851	351	3.7	356	3.6
Vermont--------	485	5	9.7	6	8.1
Virginia-------	7,343	499	1.5	524	1.4
Washington-----	11,325	373	3.0	425	2.7
West Virginia--	3,021	207	1.5	210	1.4
Wisconsin------	30,279	239	12.7	273	11.1
Wyoming--------	15,068	737	2.0	768	2.0
All-beef services 4/---	190,309	-----	----	-----	----
Reported AI activity, but State unknown 4/	5,697	-----	----	-----	----
United States--	924,381	37,433	2.5	39,951	2.3

1/ U.S. beef cows 2 years and older, January 1, 1970. Estimated by Statistical Reporting Service (USDA). Data are preliminary.

2/ U.S. beef cows 2 years and older, January 1, 1969, plus 40 percent of heifers 1-2 years old, January 1, 1969. Estimated by Statistical Reporting Service (USDA).

3/ Beef cattle on farms, January 1, 1969, are those available for breeding in 1969; 40 percent of 1-2 year old heifers were added as the percentage of those coming to breeding age in 1969 that were bred in 1969.

4/ See table 2, footnotes 2 and 3, for source of data.

TABLE 5.--Dairy cows bred artificially as a percentage of U.S. dairy cows and heifers of breeding age, 1963-1969 inclusive

Year	Dairy cows bred to dairy and beef bulls	U.S. dairy cows and heifers of breeding age 1-1-69 1/	Dairy cows bred as a percentage of U.S. dairy cows and heifers of breeding age 2/	Dairy cows bred as a percentage of U.S. dairy cows and heifers 2 years old and older 3/
	Number	Thousands	Percent	Percent
1963	7,438,293	21,124	35.2	41.2
1964	7,282,994	20,209	36.0	41.4
1965	7,264,835	19,400	37.4	43.7
1966	7,286,580	18,237	40.0	47.9
1967	7,048,358	17,318	40.7	48.1
1968	7,138,636	16,731	42.7	50.5
1969	7,285,063	16,209	44.9	52.5

1/ U.S. cows and heifers 2 years old and older kept for milk, January 1, 1969, plus 58.3 percent of heifers 1-2 years old kept for milk, January 1, 1969 (58.3% based on assumption that average age of first breeding is 17 months). Estimated by Statistical Reporting Service (USDA).

2/ Percentages to be calculated like this from 1970 and following years. These percentages are used on short line in figure 1.

3/ As previously calculated and published in the Dairy Herd Improvement Letters.

TABLE 6.--States with the highest number and percentage of dairy and beef cows bred artificially in 1969

Rank	State	Cows bred artificially	Rank	State	Cows bred artificially
		Number			Percent
		DAIRY COWS			
1	Wisconsin	1,348,308	1	Hawaii	93.6
2	New York	721,293	2	Florida	75.2
3	Minnesota	591,696	3	Utah	68.5
4	Pennsylvania	559,767	4	Connecticut	63.7
5	California	550,796	5	Pennsylvania	59.4
6	Ohio	291,388	6	Washington	57.2
7	Michigan	282,993	7	California	56.2
8	Iowa	204,215	8	New York	55.9
9	Illinois	170,635	9	Wisconsin	55.8
10	Florida	156,443	10	Massachusetts	52.8
		BEEF COWS			
1	Texas	66,865	1	Rhode Island	13.0
2	Kansas	53,424	2	Wisconsin	11.1
3	Montana	52,109	3	Pennsylvania	9.6
4	Iowa	40,459	4	Ohio	8.9
5	Missouri	34,938	5	Vermont	8.1
6	Ohio	33,555	6	Massachusetts	6.5
7	Wisconsin	30,279	7	Michigan	6.4
8	South Dakota	29,855	8	Maryland	6.2
9	Minnesota	27,918	9	New York	5.1
10	Nebraska	26,456	10	New Jersey	5.0

TABLE 7.--Comparison of artificial breeding in the United States for 1968 and 1969

State or other source	Dairy cows bred artificially--			Beef cows bred artificially--		
	In 1968	In 1969	Increase or decrease	In 1968	In 1969	Increase or decrease
	Number	Number	Number	Number	Number	Number
Alabama---------	43,001	50,877	+7,876	6,263	7,400	+1,137
Alaska----------	1,014	1,011	-3	46	20	-26
Arizona---------	17,706	29,246	+11,540	1,415	4,077	+2,662
Arkansas--------	27,913	24,899	-3,014	6,255	8,052	+1,797
California------	461,645	550,796	+89,151	20,097	20,084	-13
Colorado--------	39,140	45,861	+6,721	11,305	12,104	+799
Connecticut-----	52,786	54,174	+1,388	968	184	-784
Delaware--------	9,101	8,604	-497	85	100	+15
Florida---------	153,697	156,443	+2,746	18,295	17,865	-430
Georgia---------	58,025	65,915	+7,890	6,279	7,670	+1,391
Hawaii----------	11,100	15,906	+4,806	974	295	-679
Idaho-----------	88,287	80,674	-7,613	11,706	8,549	-3,157
Illinois--------	184,389	170,635	-13,754	19,464	15,058	-4,406
Indiana---------	110,407	111,153	+746	15,164	15,900	+736
Iowa------------	234,340	204,215	-30,125	17,800	40,459	+22,659
Kansas----------	84,535	97,106	+12,571	43,900	53,424	+9,524
Kentucky--------	119,506	119,199	-307	17,375	20,902	+3,527
Louisiana-------	72,066	71,961	-105	16,438	21,182	+4,744
Maine-----------	46,084	45,297	-787	448	105	-343
Maryland--------	84,338	91,267	+6,929	3,484	3,926	+442
Massachusetts---	43,807	44,326	+519	630	327	-303
Michigan--------	282,282	282,993	+711	8,735	9,288	+553
Minnesota-------	595,115	591,696	-3,419	19,017	27,918	+8,901
Mississippi-----	49,927	64,175	+14,248	6,578	10,245	+3,667
Missouri--------	126,087	123,949	-2,138	30,311	34,938	+4,627
Montana---------	12,926	12,541	-385	63,317	52,109	-11,208
Nebraska--------	52,704	51,502	-1,202	21,979	26,456	+4,477
Nevada----------	6,855	6,251	-604	2,608	1,862	-746
New Hampshire---	24,524	24,594	+70	279	80	-199
New Jersey------	51,887	47,899	-3,988	397	502	+105
New Mexico------	24,885	19,916	-4,969	2,255	3,590	+1,335
New York--------	721,401	721,293	-108	4,310	3,349	-961
North Carolina--	92,717	95,603	+2,886	7,053	11,116	+4,063
North Dakota----	27,351	24,124	-3,227	20,003	20,506	+503
Ohio------------	295,744	291,388	-4,356	36,936	33,555	-3,381
Oklahoma--------	30,470	30,985	+515	10,624	14,598	+3,974
Oregon----------	70,466	67,836	-2,630	12,288	10,744	-1,544
Pennsylvania----	551,068	559,767	+8,699	10,413	11,244	+831
Puerto Rico-----	70,404	72,624	+2,220	398	------	-398
Rhode Island----	5,102	3,989	-1,113	98	130	+32
South Carolina--	35,462	36,643	+1,181	2,955	2,666	-289
South Dakota----	33,192	30,062	-3,130	24,738	29,855	+5,117
Tennessee-------	91,349	93,204	+1,855	12,344	18,704	+6,360
Texas-----------	99,399	109,180	+9,781	40,575	66,865	+26,290
Utah------------	56,830	65,745	+8,915	4,379	12,851	+8,472
Vermont---------	140,696	133,584	-7,112	1,544	485	-1,059
Virginia--------	120,006	127,428	+7,422	4,618	7,343	+2,725
Washington------	146,871	131,560	-15,311	15,453	11,325	-4,128
West Virginia---	23,679	24,034	+355	2,708	3,021	+313
Wisconsin-------	1,334,019	1,348,308	+14,289	25,980	30,279	+4,299
Wyoming---------	5,235	5,710	+475	11,628	15,068	+3,440
Reported AI activity, but State unknown[1]	17,096	46,915	+29,819	3,237	5,697	+2,460
All beef [1] services -----	------	------	------	169,093	190,309	+21,216
United States---	7,138,636	7,285,063	+146,427	795,242	924,381	+129,139

[1] For 1969 see table 2 and footnotes. For 1968 see table 1 and footnotes in the May 1969 Dairy Herd Improvement Letter covering the Artificial Insemination Report for 1968.

ABLE 8.--Status of artificial breeding program in the United States, 1939-1970 inclusive

		Sires in service					Dairy cows bred to-				
ear	Studs	Dairy	Beef	Total	Average per stud	Herds[1]	Dairy bulls	Beef bulls	Beef cows bred to beef bulls	Total cattle bred	Cows bred per sire
						Number					
1939	7	---	---	33	4.7	646	---	---	---	7,359	228
1940	25	---	---	138	5.5	2,971	---	---	---	33,977	246
1941	35	---	---	237	6.8	5,997	---	---	---	70,751	299
1942	46	---	---	412	9.0	12,118	---	---	---	112,788	274
1943	59	---	---	574	9.7	23,448	---	---	---	182,524	318
1944	56	---	---	657	11.7	28,627	---	---	---	218,070	332
1945	67	---	---	729	10.9	43,998	---	---	---	360,732	495
1946	78	---	---	900	11.5	73,293	---	---	---	537,376	597
1947	84	---	---	1,453	17.3	140,571	---	---	---	1,184,168	815
1948	91	---	---	1,745	19.2	224,493	---	---	---	1,713,581	982
1949	90	---	---	1,940	21.6	316,177	---	---	---	2,091,175	1,078
1950	97	---	---	2,104	21.7	409,300	---	---	---	2,619,555	1,245
1951	94	---	---	2,187	23.3	548,300	---	---	---	3,509,573	1,605
1952	94	---	---	2,324	24.7	671,100	---	---	---	4,295,243	1,848
1953	96	---	---	2,598	27.1	755,000	---	---	---	4,845,222	1,865
1954	93	---	---	2,661	28.6	805,000	---	---	---	5,155,240	1,937
1955	79	---	---	2,450	31.0	845,900	---	---	---	5,413,874	2,210
1956	79	---	---	2,553	32.3	900,400	---	---	---	5,762,656	2,257
1957	75	---	---	2,651	35.3	946,000	---	---	---	6,055,982	2,284
1958	71	---	---	2,676	37.7	975,372	---	---	---	6,645,568	2,483
1959	64	---	---	2,460	38.4	930,059	---	---	---	6,932,294	2,816
960	62	---	---	2,544	41.0	910,000	---	---	---	7,144,679	2,808
961	56	---	---	2,486	44.4	863,781	7,047,148	[2]435,492	---	7,482,740	3,010
962	56	2,036	420	2,456	43.9	862,150	6,837,681	[2]911,006	---	7,748,687	3,155
963	51	2,158	401	2,559	50.2	621,141	6,468,545	969,748	235,289	7,673,582	2,999
964	50	2,140	398	2,538	50.8	654,311	6,165,599	1,117,395	464,959	7,747,953	3,053
965	[3]46	1,867	449	2,316	50.3	591,859	6,301,178	963,657	615,147	7,879,982	3,402
966	[3]44	1,949	439	2,388	54.3	540,265	6,413,453	873,127	695,181	7,981,761	3,342
967	35	2,012	364	2,376	67.9	458,782	6,259,425	788,933	672,819	[4]7,871,265	3,313
968	[3]33	2,028	352	2,380	72.1	407,375	6,423,786	714,850	795,242	7,933,878	3,334
969	[3]30	1,955	390	2,345	78.2	387,979	6,590,147	694,916	924,381	[5]8,209,444	3,501
970	31	1,911	364	2,275	73.4	-------	---	---	---	---	---

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[1] Prior to 1963, number of herds largely reflected membership rather than those actually serviced.
[2] Probably includes some beef to beef inseminations.
[3] Includes one all-beef stud.
[4] Total cattle bred in 1967 includes 150,088 first services, by State only, where breakdowns were not reported.
[5] Not shown are inseminations to 3,230 swine and 235 goats.

TABLE 9.--Cows bred in artificial-breeding organization bull studs in 1969

Stud code	Name of stud[1]	Herds serviced	Cows bred in 1969						Total breedings of--		Estimated total number of cows bred	Breedings of--	
			First services				Semen sales and custom-freezing						
			Dairy total	Dairy to beef	Beef to beef	Total first services	Dairy to dairy	Beef to beef	Dairy cows	Beef cows		Swine	Goats
		Number											
1607	Herdsman---------	2/169	3,379	-------	------	3,379	28,406	------	31,785	------	31,785	-----	---
2110	Eastern AIC------	32,565	646,824	69,514	765	717,103	2,734	------	719,072	765	719,837	-----	---
2309	Atlantic---------	12,323	197,629	25,026	5,532	228,187	426	------	223,081	5,532	228,613	-----	---
2311	NEBA-------------	2/8,718	152,392	20,648	1,310	174,350	1,444	------	174,484	1,310	175,794	-----	15
3102	NOBA-------------	9,556	205,440	30,547	7,238	243,225	11,350	1,735	247,337	8,973	256,310	-----	7
3303	Curtiss----------	37,217	957,074	116,408	75,978	1,149,460	------	3,000	1,073,482	78,978	1,152,460	-----	200
3401	Michigan ABC-----	5,150	131,564	16,474	4,233	152,271	12,375	2,423	160,413	6,656	167,069	-----	---
3407	General Genetics-	2/889	17,183	500	100	17,783	7,048	100	24,731	200	24,931	-----	---
3503	East Central-----	4,500	89,439	13,226	500	103,165	14,660	50	117,325	550	117,875	-----	---
3505	Tri-State--------	18,767	333,792	40,881	4,792	379,465	------	3,376	374,673	8,168	382,841	2,906	---
3521	Midwest Breeders-	37,815	565,741	78,793	19,062	663,596	72,606	27,956	717,140	47,018	764,158	-----	---
3575	ABS--------------	2/82,871	1,302,582	105,679	249,156	1,657,417	------	------	1,408,261	249,156	1,657,417	-----	---
4101	Minnesota Valley-	29,198	233,586	27,481	13,740	274,807	5,722	9,782	266,789	23,522	290,311	-----	---
4801	Kansas ABSU------	3,059	48,540	2,350	19,370	70,260	4,567	28,910	55,457	48,280	103,737	-----	---
5102	Maryland-W.Va----	3,825	72,363	6,833	4,715	83,911	5,262	2,108	84,458	6,823	91,281	-----	---
5201	Virginia ABA-----	6,598	66,158	2/9,181	2/3,222	78,561	7,116	1,850	82,455	5,072	87,527	-----	---
5501	N.C.Instit.B.P---	11	933	6	-------	939	30	------	969	------	969	-----	---
6102	Select Sires 3/--	30,154	231,327	36,404	28,379	296,110	122,030	68,446	389,761	96,825	486,586	324	6
6301	East Tennessee---	6,509	18,352	3,246	2,550	24,148	6,501	5,533	28,099	8,083	36,182	-----	---
6302	Tennessee ABA----	5,000	21,690	2,433	5,229	29,352	200	200	24,323	5,429	29,752	-----	---
6303	West Tennessee---	1,027	4,493	590	1,034	6,117	------	------	5,083	1,034	6,117	-----	---
6502	Mississippi ABC--	600	23,098	2,702	900	26,700	17,987	2,743	43,787	3,643	47,430	-----	---
7201	Louisiana ABC----	4,758	54,687	7,934	6,825	69,446	4,149	13,440	66,770	20,265	87,035	-----	2
8701	Cache Valley-----	2/6,686	46,151	4,840	17,295	68,286	------	17,507	50,991	34,802	85,793	-----	---
9111	Carnation--------	2/21,892	342,058	44,078	51,701	437,837	------	------	386,136	51,701	437,837	-----	---
9113	All West---------	15,257	126,893	2/18,599	2/14,554	160,046	------	------	145,492	14,554	160,046	-----	5
9302	Adohr------------	6	5,773	------	------	5,773	------	------	5,773	------	5,773	-----	---
9303	Excelsior--------	135	37,226	290	60	37,576	25,485	300	63,001	360	63,361	-----	---
9316	Genetics, Inc----	2,270	258,815	10,253	3,644	272,712	------	------	269,068	3,644	272,712	-----	---
9401	P.R. AI Center---	419	34,924	------	------	34,924	3,698	------	38,622	------	38,622	-----	---
9601	Matanuska Valley-	35	329	------	------	329	------	------	329	------	329	-----	---
	Reported AI activity by individual operators 4/	------	-------	------	------	------	5,916	2,729	5,916	2,729	8,645	-----	---
8406	International Beef Breeders 5/	------	-------	------	44,288	44,288	------	135,654	-------	179,942	179,942	-----	---
5103	Wye Plantation 5/	------	-------	------	10,367	10,367	------	-------	-------	10,367	10,367	-----	---
	United States----------	387,979	6,230,435	694,916	596,539	7,521,890	359,712	327,842	7,285,063	924,381	8,209,444	3,230	235

1/ See table 11 for list of names and addresses of studs.

2/ Data may have been all or partially estimated when incomplete report was given.

3/ See table 10, footnote 3, for studs that merged with Select Sires during 1969. Data for cows bred during 1969 were submitted by the individual studs.

4/ Data were reported by Extension Dairyman in Arizona.

5/ Information obtained from National Association of Animal Breeders, P.O. Box 1033, Columbia, Mo. 65201.

TABLE 10.--Bulls used in artificial-breeding organization bull studs during 1969

Stud code	Name of stud[1]	Bulls by breed[2]								Type of service by dairy bulls		
		Ayr-shire	Brown Swiss	Guern-sey	Hol-stein	Jer-sey	Short-horn	Beef	Total	Regular	Special or planned mating	Progeny testing
		Number										
1607	Herdsman---------	--	--	--	1	--	--	--	1	1	---	---
2110	Eastern AIC------	16	8	18	222	28	--	9	301	95	7	190
2309	Atlantic---------	2	3	13	34	3	--	17	72	41	6	8
2311	NEBA-------------	5	2	10	70	10	--	2	99	47	2	48
3102	NOBA-------------	--	4	11	34	19	--	22	90	68	---	---
3303	Curtiss----------	7	5	12	103	12	4	47	190	121	13	9
3407	General Genetics-	--	--	--	3	--	--	--	3	1	---	2
3503	East Central-----	--	1	--	29	--	--	5	35	30	---	---
3505	Tri-State--------	1	6	20	70	8	--	14	119	78	14	13
3521	Midwest Breeders-	--	5	12	80	4	2	15	118	45	17	41
3575	ABS--------------	5	5	10	292	17	2	75	406	68	60	203
4101	Minnesota Valley-	2	6	7	90	2	4	21	132	110	1	---
4801	Kansas ABSU------	--	2	1	21	1	--	24	49	9	4	12
5102	Maryland-W.Va----	5	3	10	31	5	--	7	61	43	---	11
5501	N.C. Instit.B.P--	--	--	--	13	--	--	1	14	1	1	11
6102	Select Sires 3/--	1	9	24	144	30	1	40	249	56	---	153
6303	West Tennessee---	--	--	--	3	2	--	5	10	5	---	---
7201	Louisiana ABC----	--	--	5	11	8	--	14	38	6	3	15
9111	Carnation--------	2	5	8	53	7	2	28	105	77	---	---
9113	All West---------	--	--	12	37	12	--	4/16	77	56	5	---
9302	Adohr------------	--	--	6	8	--	--	--	14	12	2	---
9303	Excelsior--------	--	1	--	26	--	--	--	27	9	1	17
9316	Genetics, Inc----	--	1	3	39	5	--	2	50	13	1	34
9401	P.R. AI Center---	--	--	--	10	--	--	--	10	10	---	---
9601	Matanuska Valley-	--	--	--	5	--	--	--	5	5	---	---
	United States----------	46	66	182	1,429	173	15	364	2,275	1,007	137	767

[1] See table 11 for list of names and addresses of studs.

[2] These counts are based on where bulls are housed and do not reflect the fact that they are available to more than one stud.

[3] AI bull studs that merged with Select Sires, Inc. during 1969 are: Michigan ABC; Virginia ABA; East Tennessee; Tennessee ABA; Mississippi ABC; and Cache Valley. The sires that they owned and were retained as of January 1, 1970 are reflected in the number credited to Select Sires.

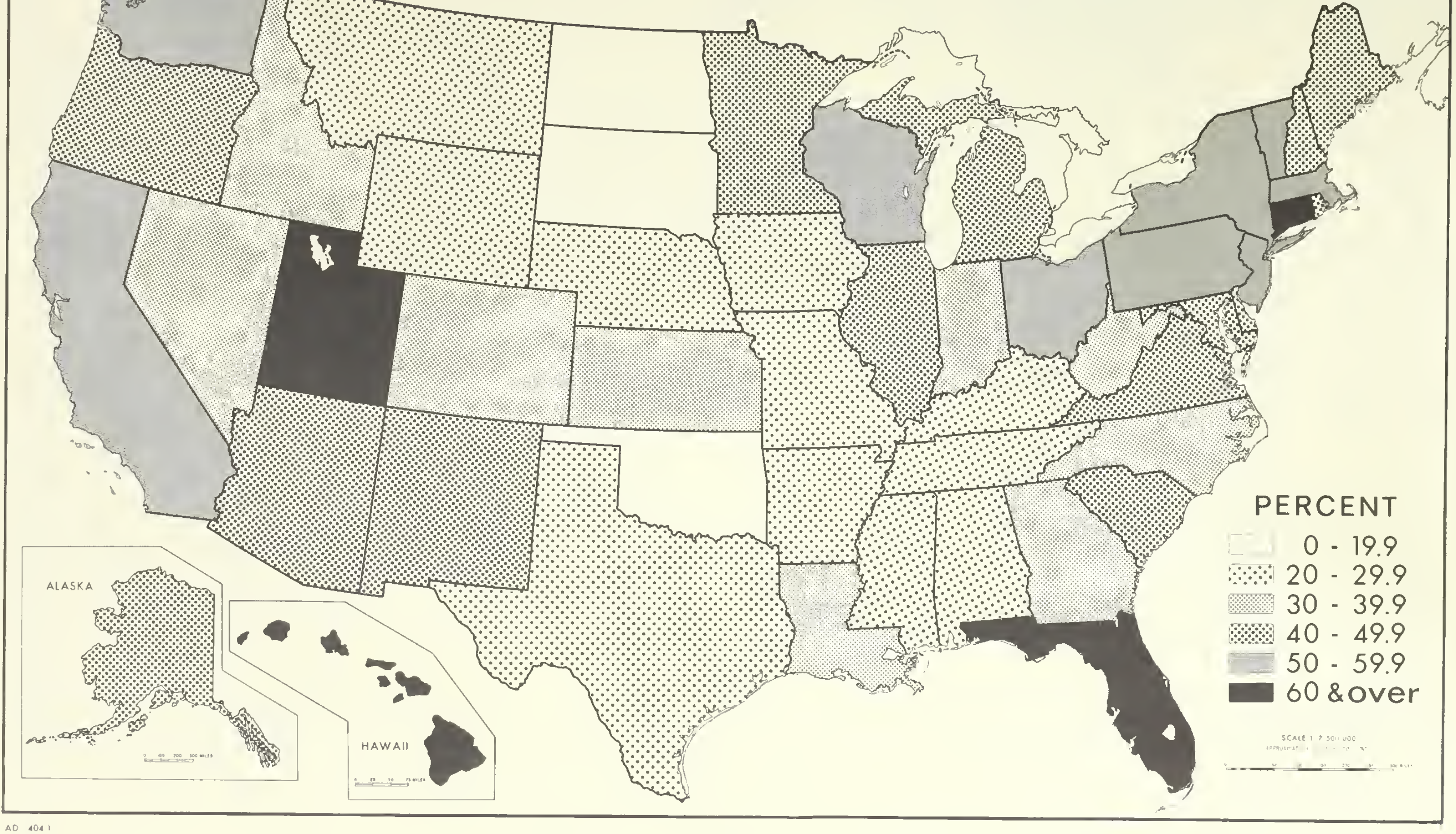
[4] Based on report of January 1, 1969.

TABLE 11.--Artificial-breeding organization bull studs in the United States

State	Stud code	Name and address
Alaska----------	9601	Matanuska Valley Breeders Association, Box AE, Palmer 99645.
California-------	9302	Adohr Farms Inseminating Service, P.O. Box 88, Camarillo 93010.
	9303	Excelsior Farms Artificial Breeding Service, Rt. 1, Box 128, Corona 91720.
	9316	Genetics, Inc., Box 938, Hughson 95326.
Connecticut------	1607	Herdsman, Box 391, Putnam 06260.
Illinois---------	3303	Curtiss Breeding Service, Inc., Cary 60013.
Kansas-----------	4801	Kansas Artificial Breeding Service Unit, Kansas State University, Manhattan 66502.
Louisiana--------	7201	La. Animal Breeders Co-op., Inc., Louisiana State University, Box BD, Baton Rouge 70803.
Maryland---------	5102	Maryland-West Virginia Bull Stud, Inc., Box 555, Frederick 21701.
Michigan---------	3401	Michigan Animal Breeders Co-op., Inc., 3655 Forest Road, East Lansing 48823.
	3407	General Genetics, Box 23, Jenison 49428.
Minnesota--------	4101	Minnesota Valley Breeders Association, New Prague 56071.
Mississippi------	6502	Mississippi Animal Breeders Co-op., Drawer BA, State College 39762.
New York---------	2110	Eastern Artificial Insemination Co-op., Inc., Box 518, Ithaca 14850.
North Carolina---	5501	N. C. Institutional Breeding Assoc., 231 Polk Hall, North Carolina State University,Raleigh 27607.
Ohio-------------	3102	NOBA, Inc., Box 607, Tiffin 44883.
	6102	Select Sires, Inc., 1224 Alton-Darby Road, Columbus 43228.
Pennsylvania-----	2309	Atlantic Breeders Co-op., Box 254, Lancaster 17604.
	2311	Northeastern Breeders Assoc., Inc., R.D. 2, Tunkhannock 18657.
Puerto Rico------	9401	Puerto Rico Artificial Insemination Center, Inc., Box 958, Dorado 00646.
Tennessee--------	6301	East Tennessee ABA, Rt. 10, Tipton Station Road, Knoxville 37920.
	6302	Tennessee Artificial Breeding Assoc., Granny White Pike, Box 67, Brentwood 37027.
	6303	West Tennessee ABA, Box 38, Yorkville 38389.
Utah-------------	8701	Cache Valley Breeding Association, 1950 North Main, Logan 84321.
Virginia---------	5201	Virginia Animal Breeders Assoc., Inc., Drawer 370, Rocky Mount 24151.
Washington-------	9113	All West Breeders, Box 197, Burlington 98233.
	9111	Carnation Farms Breeding Service, Carnation 98014.
Wisconsin--------	3575	American Breeders Service, Inc., De Forest 53532.
	3503	East Central Breeders Association Co-op., Box 191, Highway 26, Waupun 53963.
	3521	Midwest Breeders Co-op., Box 469, Shawano 54166.
	3505	Tri-State Breeders Co-op., Westby 54667.
ALL-BEEF STUDS		
Colorado---------	8406	International Beef Breeders, Inc., Box 29007, Denver 80229.
Maryland---------	5103	Wye Plantation, Queenstown 21658.

PERCENTAGE OF U.S. DAIRY COWS & HEIFERS BRED ARTIFICIALLY

1969



AD 404 1

EXTENSION DAIRYMEN IN CHARGE OF DAIRY CATTLE BREEDING

Ala------R. S. Jones, Jr., Dairy Science Dept., Auburn University, Auburn 36830.
Alaska---A. L. Brundage, Experiment Station Research Staff, University of Alaska, Palmer 99645.
Ariz-----W. R. Van Sant, Dept. of Dairy Science, University of Arizona, Tucson 85721.
Ark------L. Ratcliff, Animal Industry & Veterinary Science Dept., University of Arkansas, Little Rock 72203.
Calif----F. D. Murrill, Animal Science Bldg., University of California, Davis 95616.
Colo-----D. C. Jordan, Animal Science Dept., Colorado State University, Fort Collins 80521.
Conn-----R. H. Benson, Animal Industries Dept., University of Connecticut, Storrs 06268.
Del------W. R. Hesseltine, College of Agr. Sciences, University of Delaware, Newark 19711.
Fla------C. W. Reaves, Dairy Science Bldg., University of Florida, Gainesville 32601.
Ga-------J. N. Maddux, Animal Industry Division, University of Georgia, Athens 30601.
Hawaii---H. R. Donoho, Animal Science Dept., University of Hawaii, Honolulu 96822.
Idaho----G. W. Cleveland, Dairy Science Dept., University of Idaho, P.O. Box 300, Boise 83701.
Ill------J. G. Cash, Dairy Science Dept., University of Illinois, Urbana 61803.
Ind------N. J. Moeller, Dept. of Animal Sciences, Purdue University, Lafayette 47907.
Iowa-----B. R. Eastwood, Animal and Dairy Science Dept., Iowa State University, Ames 50010.
Kans-----E. R. Bonewitz, Dairy Science Dept., Kansas State University, Manhattan 66504.
Ky-------J. H. Nicolai, Jr., Dairy Production Dept., University of Kentucky, Lexington 40506.
La-------H. W. Anderson, La. Agr. Extension Service, Louisiana State University, Baton Rouge 70803.
Maine----N. R. Ness, Animal Science Dept., University of Maine, Orono 04473.
Md-------J. L. Cason, Dairy Science Dept., University of Maryland, College Park 20742.
Mass-----S. N. Gaunt, Veterinary and Animal Sciences Dept., University of Massachusetts, Amherst 01003.
Mich-----C. E. Meadows, Dairy Genetics and Breeding, Michigan State University, East Lansing 48823.
Minn-----B. J. Conlin, Dept. of Animal Science, University of Minnesota, St. Paul 55101.
Miss-----G. B. Crain, Dairy Science Dept., Mississippi State University, State College 39762.
Mo-------A. G. Lane, Dairy Husbandry Dept., University of Missouri, Columbia 65202.
Mont-----B. R. Moss, Dept. of Animal Science and Range Management, Montana State University, Bozeman 59715.
Nebr-----P. H. Cole, Dairy Science Dept., University of Nebraska, Lincoln 68503.
Nev------H. P. Adams, Animal Science Dept.,University of Nevada, Reno 89507.
N. H-----T. P. Fairchild, Animal Science Dept., University of New Hampshire, Durham 03824.
N. J-----E. T. Oleskie, Animal Science Dept., Rutgers University, New Brunswick 08903.
N. Mex---J. B. Ells, Dairy Dept., New Mexico State University, University Park 88070.
N. Y-----H. W. Carter, Animal Husbandry Dept., Cornell University, Ithaca 14850.
N. C-----F. D. Sargent, Animal Science Dept., North Carolina State University, Raleigh 27607.
N. Dak---G. R. Fisher, Dairy Husbandry Dept., North Dakota State University, Fargo 58103.
Ohio-----C. D. McGrew, Dairy Science Dept., Ohio State University, Columbus 43210.
Okla-----C. H. Burton, Dept. of Dairying, Oklahoma State University, Stillwater 74074.
Oreg-----D. E. Anderson, Animal Science Dept., Oregon State University, Corvallis 97331.
Pa-------L. W. Specht, Dairy Science Dept., Pennsylvania State University, University Park 16802.
P. R-----C. A. Calderon, Animal Husbandry Dept., University of Puerto Rico, Rio Piedras 00928.
R. I-----J. W. Atwood, Dairy Science Dept., University of Rhode Island, Kingston 02881.
S. C-----W. L. Northern, Dairy Science Dept., Clemson University, Clemson 29631.
S. Dak---E. J. Kleen, Dairy Science Dept., South Dakota State University, Brookings 57007.
Tenn-----C. K. Chappell, Dairy Dept., University of Tennessee, Knoxville 37916.
Tex------A. M. Meekma, Dairy Science Dept., Texas A & M University, College Station 77841.
Utah-----J. J. Barnard, Dairy Industry Dept., Utah State University, Logan 84321.
Vt-------S. Gibson, Animal and Dairy Science Dept., University of Vermont, Burlington 05401.
Va-------W. N. Patterson, Dairy Science Dept., Virginia Polytechnic Institute, Blacksburg 24061.
Wash-----B. F. Kelso, W. W. Research and Extension Center, Puyallup 98371.
W. Va----R. O. Kelley, Animal Industry and Veterinary Science Dept., West Virginia University, Morgantown 26506.
Wis------E. E. Starkey, Dairy Science Dept., University of Wisconsin, Madison 53706.
Wyo------I. W. Slater, Division of Animal Science, University of Wyoming, Laramie 82071.

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CONTENTS

Page
I. USDA termination codes--What are they? Why are they used? How are they used? 2
II. Lactation records received by USDA in 1969........ 7

Issued December 1970

USDA TERMINATION CODES--WHAT ARE THEY? WHY ARE THEY USED? HOW ARE THEY USED?

by G. J. King and B. T. McDaniel[1/]

What are Termination Codes?

The 1967 DHI Computing Center Workshop adopted a set of termination codes to define the reasons for terminating cows' lactation records. The codes appear as the numbers zero through nine in lactation records. They take the place of the previously used codes for conditions affecting records (C.A.R. codes) as the basis for deciding whether or not to project a record to a 305-day basis when a cow was denied an opportunity to milk that long.

USDA suggests that the termination codes also be used to specify the reasons for cows leaving herds after completing 305-day lactations. An example is the selling of a cow immediately after she completes a 305-day lactation because she is not pregnant. Such a record would carry a "4" termination code even though it was 305 days long.

Use of the termination codes in this manner would give more complete data on the reasons for, and respective frequencies of, losses of different sires' daughters in succeeding lactations. It would also give better information on the frequencies and reasons for cow losses at different ages, for different herd sizes, and under different types of management practices. This information might help dairymen spot areas of their management or breeding that are contributing to short productive life of their cows.

The use in a 305-day record of a termination code which calls for a projection of the record is acceptable because the projection factor for a 305-day record is 1.00.

[1/] With technical assistance of C. A. Rampendahl and J. J. Corbin

The termination codes and their meanings are as follows:

Termination code	Meaning
0	Normal lactation terminated by dry date or 305 days in lactation when cow is still in the herd.
1	Incomplete terminated record of at least one valid test followed by two or more consecutive missed tests or a period of more than 75 days between consecutive tests, but the cow remains in the herd. The record up to the missed test to be coded "1" and sent to USDA--project to 305 days. [a]
2	Sold for dairy purposes--project to 305 days.
3*	Sold because of low production--project to 305 days.
4*	Sold because of reproductive problems--project to 305 days.
5*	Sold because of disease, injury, or unspecified reason --project to 305 days.
6*	Died--project to 305 days.
7*	Sold because of mastitis or other udder problem--project to 305 days.
8	Record ended by an abortion--project to 305 days.
9	Record not to be used for sire or cow evaluation. [b]

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*Centers unable to use codes 3 through 7 in the manner shown should code all these categories as code 3.

[a] The complete record of 305 days or less for a lactation that was terminated due to two consecutive missed tests or to having consecutive tests more than 75 days apart should be coded "9" and sent to USDA also. Some valid reasons for missed tests are (1) broken, spilled, or accidentally missed samples; (2) cow goes on show circuit during lactation.

[b] Lactation initiated by abortion; complete record with two or more consecutive months missing where valid portion of record has previously been submitted to USDA as code 1; a record for which any two consecutive tests were more than 75 days apart; no test within 78 days of calving. (The number of days is changed from 60 in accordance with the Official DHI Rules, Revised and Accepted by the Coordinating Group, July 1969.)

Why Use Termination Codes?

It is extremely important that the proper termination code accompany a cow's record so that it will be projected to a 305-day basis if the cow didn't have a chance to finish the record. Failure to project such a record (thus calling the record short, but complete) penalizes both the cow and sire. On the other hand, if improper coding causes a cow's record to be projected when it shouldn't be, the cow's index and her sire's Predicted Difference may be too high.

Proper use of the termination codes offers valuable information for evaluating sires on traits in addition to production. Codes 3, 4, 5, and 7 show the percentage of a bull's daughters that are culled. If this percentage is high, it may indicate that the sire is transmitting weaknesses in traits other than production that contribute to profitability. If there is a high percentage of code 3's (sold for low production), code 4's (sold for reproductive problems), or code 7's (sold because of mastitis or other udder problem), a dairyman should think twice before using heavily a bull that sired such daughters. For situations when daughters of a bull are in many herds, a high percent-incomplete-first-records in the USDA-DHIA Sire Summary List probably indicates heavy culling. Twelve percent incomplete first records is about average now.

How are Termination Codes Used?

Six of the 12 dairy records processing centers are now using the full set of termination codes shown on page 3 and accepted by the 1967 DHI Computing Center Workshop. The other six are using local C.A.R. and status codes for particular types of record terminations. This is acceptable (though not desirable) for sire evaluation because these centers have informed Dairy Herd Improvement Investigations (DHII) which of these codes indicate records to be projected. However, the additional information on the reasons for culling cows is not available unless the full set is used.

Tables I-1 through I-6 appear on pages 8 through 13 and give numbers and percentages of the termination codes grouped according to stage of lactation when the record was terminated, i.e., 1 to 14 days, 15 to 89 days, 90 to 179 days, 180 to 239 days, 240 to 279 days, 280 to 304 days, and 305 days only.

Tables I-1 and I-2 summarize the termination codes reported on all lactation records received by USDA for entry in 1968 and 1969 sire summary runs. Data in 1968 indicate that of the total of 1,975,276 lactation records reported, 1,778 were less than 15 days long and thus not used. Similarly, 2,317 of 2,106,631 records were less than 15 days long in 1969. These are classified according to termination code, and it is interesting to note that in 1968, 196 records of less than 15 days were coded as being complete. In 1969, 215 were coded as complete records, and two were coded as being ended by abortion. The appearance of the abortion code after only 15 days in milk probably indicates miscoding.

Table I-2 shows that 419,475 records were used in 1969 by projecting to a 305-day basis. Of this number, 356,494 were made by cows which were then lost to dairying. This was 16.9 percent of the lactations reported. The 16.9 percent is composed of all lactations having codes 3, 4, 5, 6, and 7. In addition, other cows are lost for which USDA does not receive a record, such as those which die at calving or are slaughtered after going dry. These would probably raise the proportion of cows lost to dairying each year to approximately 20 percent. This turnover of nearly one-fifth of the Nation's dairy herd each year has remained fairly constant for several years. Reduction of this loss of productivity is a research goal of the Animal Science Research Division.

Tables I-3 and I-4 show the percentages for each termination code-period-of-lactation group for 1968 and 1969. In 1968, 48.1 percent of the records sent to USDA were 305 days long compared with 48.4 percent in 1969. At the other extreme, records under 15 days made up about 0.1 percent of the records in both years. These were not used in sire evaluation. In 1968, 32.2 percent of the records sent to USDA were short, complete records of less than 305 days; in 1969, the comparable value was 31.6 percent. Thus, it was necessary to project to a 305-day basis about 20 percent of the records submitted in each year.

In 1968, 3.7 percent of the records used for sire evaluation were less than 90 days in length. The figure for 1969 was 3.9 percent. The number of records for 90 to 179 days in 1968 was 6.5 percent of the total and 6.8 percent in 1969.

The figures for records projected increased in most categories in 1969 over 1968. Only at 240 to 279 days and at 280 to 304 days did percentages decrease.

Tables I-5 and I-6 give the percentages of records in days-in-milk groups within termination codes for 1968 and 1969, respectively.

Improper Use of Termination Codes.

There is apparently some misunderstanding of the use of termination codes as they are entered into the records --a subject for an educational program in the States.

A few records (45) in the two years that were less than either 152 days or 200 days in length (90 to 179 days) were coded as terminated by abortion. Official DHI Rule 11 states that "if a cow aborts while in milk and has carried a calf less than 152 days" or "if a breeding date is not available and the cow aborts while in milk for less than 200 days, her current record will continue without interruption." If these records are otherwise normal, and are terminated by a dry date or 305 days in lactation, the termination code "0" should be used.

Proper Use of Termination Codes.

The reporting of some codes, however, is apparently more precise, because their use for a purpose and cow disposal history coincide. For instance code 4 appears most frequently in lactations of 180 to 279 days--the stage when non-pregnant cows are often sold. Code 7 appears more frequently in short lactations, which is consistent with practice because cows affected by mastitis early in lactation are more likely to be sold than those affected at later stages.

Summary

USDA uses termination codes to find that almost one-third of the records used for sire summaries are complete records of less than 305 days, and to project another one-fifth of the records to a 305-day basis. Therefore, much research is still needed on the effect of short records on sire summaries and on the accuracy of projection factors.

II. LACTATION RECORDS RECEIVED BY USDA IN 1969[2]

In 1969, 1,870,276 Official DHI lactation records were reported to USDA for use in statistical summaries, genetic appraisals, and research. This is 46,555 less than were reported in 1968. The numbers of records reported by State in 1969 are given in table II-1.

A 13-year summary of the records reported since 1957 is shown in table II-2.

2/ Tables prepared by C. A. Rampendahl from data received in the DHII office.

TABLE I-1.--Termination code distribution within days-in-milk groups for the runs of January, May, and September 1968

Termination code	Days in milk							Total records
	1-14	15-89	90-179	180-239	240-279	280-304	305 only	
	Number of records							
0	196	4,643	10,673	40,610	219,806	360,830	933,678	1,570,436
1	---	-----	4	4	15	15	117	155
2	504	21,159	23,979	16,350	10,295	5,593	1,990	79,870
3	952	41,274	86,566	76,959	48,837	24,469	10,644	289,701
4	1	229	1,616	3,336	3,173	1,923	1,269	11,547
5	26	1,413	1,564	933	552	256	189	4,933
6	68	1,435	1,094	527	297	180	44	3,645
7	31	2,179	3,385	2,200	1,185	561	312	9,853
8	---	7	26	815	1,809	1,385	1,094	5,136
9	---	-----	------	------	-------	-------	-------	---------
Overall	1,778	72,339	128,907	141,734	285,969	395,212	949,337	1,975,276
Total records projected	----	67,696	118,234	101,124	66,163	34,382	-------	387,599

TABLE I-2.--Termination code distribution within days-in-milk groups for the runs of January, May, and September 1969

Termination code	Days in milk							Total records
	1-14	15-89	90-179	180-239	240-279	280-304	305 only	
	Number of records							
0	215	6,974	14,633	43,365	218,601	381,322	1,003,564	1,668,674
1	5	51	48	52	63	121	409	749
2	602	21,863	22,974	14,879	9,032	4,974	1,529	75,853
3	1,096	44,548	92,354	82,379	51,422	25,501	11,933	309,233
4	18	531	2,724	4,859	4,442	2,773	784	16,131
5	120	2,836	3,892	2,704	1,592	803	456	12,403
6	179	2,170	1,620	850	443	292	79	5,633
7	80	3,032	4,538	2,802	1,623	773	246	13,094
8	2	16	19	721	1,795	1,364	944	4,861
9	-----	------	------	------	-------	-------	---------	---------
Overall	2,317	82,021	142,802	152,611	289,013	417,923	1,019,944	2,106,631
Total records rejected	-----	75,047	128,169	109,246	70,412	36,601	---------	419,475

TABLE I-3.--Percentages of termination code distribution within days-in-milk groups for the runs of January, May, and September 1968

Termination code	Days in milk							Overall within termination code
	1-14	15-89	90-179	180-239	240-279	280-304	305 only	
	Percent							
0	0.01	0.24	0.54	2.06	11.13	18.26	47.26	79.50
1	----	----	(1/)	(1/)	(1/)	(1/)	.01	.01
2	.03	1.07	1.21	.83	.52	.28	.10	4.04
3	.05	2.09	4.38	3.90	2.47	1.24	.54	14.67
4	(1/)	.01	.08	.17	.16	.10	.06	.58
5	(1/)	.07	.08	.05	.03	.01	.01	.25
6	(1/)	.07	.06	.02	.02	.01	(1/)	.18
7	(1/)	.11	.17	.11	.06	.03	.02	.50
8	----	(1/)	(1/)	.04	.09	.07	.06	.26
9	----	----	----	----	-----	-----	-----	-----
Overall	.09	3.66	6.52	7.18	14.48	20.00	48.06	99.99
Percentage of records projected	----	3.42	5.98	5.12	3.35	1.74	-----	19.61

1/ Less than 0.01 percent.

TABLE I-4.--Percentages of termination code distribution within days-in-milk groups for the runs of January, May, and September 1969

Termination code	Days in milk							Overall within termination code
	1-14	15-89	90-179	180-239	240-279	280-304	305 only	
	Percent							
0	0.01	0.33	0.69	2.06	10.38	18.10	47.64	79.21
1	(1/)	(1/)	(1/)	(1/)	(1/)	.01	.02	.03
2	.03	1.04	1.09	.71	.43	.24	.07	3.61
3	.05	2.11	4.38	3.91	2.44	1.21	.57	14.67
4	(1/)	.03	.13	.23	.21	.13	.04	.77
5	.01	.13	.18	.13	.08	.04	.02	.59
6	.01	.10	.08	.04	.02	.01	(1/)	.26
7	(1/)	.14	.22	.13	.08	.04	.01	.62
8	(1/)	(1/)	(1/)	.03	.09	.06	.04	.22
9	----	----	----	----	-----	-----	-----	-----
Overall	.11	3.88	6.77	7.24	13.73	19.84	48.41	99.98
Percentage of records projected	----	3.55	6.08	5.18	3.35	1.74	-----	19.90

1/ Less than 0.01 percent.

TABLE I-5.--Percentage of records in days-in-milk groups within termination codes for the runs of January, May, and September 1968

Termination code	Days in milk						
	1-14	15-89	90-179	180-239	240-279	280-304	305 only
	Percent						
0	0.01	0.30	0.68	2.59	14.00	22.98	59.45
1	----	-----	2.58	2.58	9.68	9.68	75.48
2	.63	26.49	30.02	20.47	12.89	7.00	2.49
3	.33	14.25	29.88	26.56	16.86	8.45	3.67
4	.01	1.98	13.99	28.89	27.48	16.65	10.99
5	.53	28.64	31.70	18.91	11.19	5.19	3.83
6	1.87	39.37	30.01	14.46	8.15	4.94	1.21
7	.31	22.12	34.36	22.33	12.03	5.69	3.17
8	----	.14	.51	15.87	35.22	26.97	21.30
9	----	-----	-----	-----	-----	-----	-----

TABLE I-6.--Percentage of records in days-in-milk groups within termination codes for the runs of January, May, and September 1969

Termination code	Days in milk						
	1-14	15-89	90-179	180-239	240-279	280-304	305 only
	Percent						
0	0.01	0.42	0.88	2.60	13.10	22.85	60.14
1	.67	6.81	6.41	6.94	8.41	16.15	54.61
2	.79	28.82	30.29	19.62	11.91	6.56	2.02
3	.35	14.41	29.87	26.64	16.63	8.25	3.86
4	.11	3.29	16.89	30.12	27.54	17.19	4.86
5	.97	22.87	31.38	21.80	12.84	6.47	3.68
6	3.18	28.52	28.76	15.09	7.86	5.18	1.40
7	.61	23.16	34.66	21.40	12.39	5.90	1.88
8	.04	.33	.39	14.83	36.93	28.06	19.42
9	----	-----	-----	-----	-----	-----	-----

TABLE II-1.--Lactation records received in 1969 [1]

State	Official DHI cows on test 1-1-69	1969 production records		1968 production records	
		Total	Proportion of cows enrolled in Official DHI	Total	Proportion of cows enrolled in Official DHI
	Number	Number	Percent[2]	Number	Percent[2]
Alabama----------	32,277	33,630	104.2	25,733	80.2
Alaska-----------	232	193	83.2	170	86.7
Arizona----------	20,574	7,801	37.9	6,764	47.3
Arkansas---------	5,098	4,616	90.5	4,080	93.3
California-------	363,627	113,122	31.1	65,131	17.5
Colorado---------	18,496	14,106	76.3	8,713	45.2
Connecticut------	23,560	23,708	100.6	32,122	141.7
Delaware---------	4,661	5,058	108.5	6,145	145.1
Florida----------	20,584	21,745	105.6	16,855	80.0
Georgia----------	31,507	32,409	102.9	27,149	87.2
Hawaii-----------	3,032	2,531	83.5	3,941	91.2
Idaho------------	25,786	28,243	109.5	24,715	109.9
Illinois---------	57,483	85,234	148.3	71,040	122.4
Indiana----------	39,409	39,493	100.2	42,056	96.1
Iowa-------------	62,113	61,030	98.3	58,356	96.0
Kansas-----------	39,640	39,456	99.5	37,493	98.2
Kentucky---------	23,733	25,086	105.7	19,431	82.7
Louisiana--------	10,549	9,877	93.6	6,534	78.2
Maine------------	17,905	19,344	108.0	26,670	142.0
Maryland---------	41,040	34,400	83.8	38,362	92.0
Massachusetts----	20,032	20,261	101.1	28,114	140.4
Michigan---------	79,632	72,691	91.3	66,919	85.7
Minnesota--------	123,790	[3] 112,325	90.7	120,901	101.6
Mississippi------	22,907	23,592	103.0	17,710	80.9
Missouri---------	29,323	28,155	96.0	25,508	97.3
Montana----------	5,090	2,137	42.0	2,005	46.5
Nebraska---------	19,338	18,755	97.0	17,943	95.5
Nevada-----------	4,748	1,938	40.8	1,735	27.2
New Hampshire----	10,313	12,014	116.5	18,336	140.9
New Jersey-------	22,488	24,183	107.5	34,273	142.9
New Mexico-------	6,790	8,789	129.4	6,343	91.7
New York---------	188,007	198,395	105.5	276,640	148.3
North Carolina---	50,377	55,220	109.6	43,790	87.8
North Dakota-----	6,271	6,111	97.4	5,033	85.3
Ohio-------------	88,729	85,456	96.3	88,835	97.6
Oklahoma---------	19,188	18,094	94.3	16,786	98.7
Oregon-----------	26,600	28,247	106.2	25,731	106.3
Pennsylvania-----	157,838	144,516	91.6	203,108	114.0
Puerto Rico------	1,007	-------	-----	-------	-----
Rhode Island-----	1,908	1,884	98.7	2,928	131.3
South Carolina---	29,261	29,379	100.4	22,201	84.1
South Dakota-----	6,914	6,913	100.0	5,985	106.8
Tennessee--------	30,840	32,790	106.3	26,353	85.0
Texas------------	33,402	32,433	97.1	27,456	84.5
Utah-------------	22,318	18,883	84.6	19,002	90.0
Vermont----------	38,335	40,676	106.1	58,010	148.3
Virginia---------	63,789	67,979	106.6	55,807	88.6
Washington-------	42,714	53,106	124.3	44,209	118.7
West Virginia----	9,661	9,843	101.9	12,241	146.3
Wisconsin--------	134,594	114,203	84.8	121,248	92.4
Wyoming----------	1,443	226	15.7	221	14.1
United States----	2,138,953	1,870,276	87.4	1,916,831	89.9

[1] Lactation record input for May and September 1969, and January 1970 production runs.

[2] Percentages vary by State and may exceed 100 percent depending upon reporting and processing procedures in December and January of each year and year-to-year changes in reporting procedures.

[3] Does not include approximately 18,000 lactation records that were resubmitted from Minnesota computing center.

TABLE II-2.--Thirteen-year summary of lactation records received by USDA

Year	Official DHI cows enrolled on January 1 of each year	Lactation records reported to USDA	Official DHI cows represented by records reported
	Number	Number	Percent
1957-----	1,479,799	565,360	38
1958-----	1,548,884	786,496	51
1959-----	1,607,538	927,998	58
1960-----	1,746,752	886,495	51
1961-----	1,867,469	1,084,799	58
1962-----	1,958,355	1,211,407	62
1963-----	2,006,534	1,320,423	66
1964-----	2,010,144	1,437,959	72
1965-----	2,087,581	1,749,752	84
1966-----	2,058,592	1,788,974	87
1967-----	2,098,919	1,851,274	88
1968-----	2,131,929	1,916,831	90
1969-----	2,138,953	1,870,276	87

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AGRICULTURAL RESEARCH SERVICE, U. S. DEPARTMENT OF AGRICULTURE

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EDITING OF LACTATION RECORDS USED IN USDA-DHIA GENETIC EVALUATIONS OF SIRES AND COWS [1] [2]

Lactation records of cows enrolled in Official DHI, including DHIR, recordkeeping programs are eligible for use in USDA-DHIA genetic evaluations. Those records submitted to USDA are edited extensively to insure the accuracy, integrity and consistency of lactation data and of the genetic evaluations of cows and sires for which the data are used. To obtain unbiased genetic evaluations of dairy animals, proper age adjustments of records must be made; the correct number of available daughters and records must be used; cows must be identified correctly by sire; and a cow's records must be matched with the appropriate herdmates' records. All these things can be done only when each lactation record is identified accurately.

Records failing the edits are not used in genetic evaluations. Although records of grade cows with sire numbers

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[1] Prepared by G. J. King, B. T. McDaniel, F. N. Dickinson, C. A. Rampendahl, V. H. Lytton, L. G. Waite, and J. J. Corbin.

[2] Robert R. Day designed the computer procedures for the editing described in this Dairy-Herd-Improvement Letter. He is now with Data Systems Application Division, Agricultural Research Service, U.S. Department of Agriculture.

Issued March 1971

that are all zeros are not used as individual records of daughters of particular bulls or as their herdmates, they are included in the system for use in the State and national breed averages. In 1969, of the 1,870,276 lactation records submitted to USDA, the following numbers of records were rejected:

Edit and reason for rejection	Number	Percent of records submitted
Preliminary edit--identification number all zeros for sires of grade cows	802,079	42.89
Preliminary edit--other invalid entries	13,279	.71
Main edit--conflicts with another record	54,546	2.92
Total	869,904	46.52

For the May 1970 run alone, 589,277 lactation records were submitted, and rejects were as follows:

Edit and reason for rejection	Number	Percent of records submitted
Preliminary edit--identification number all zeros for sires of grade cows	244,934	41.57
Preliminary edit--other invalid entries	2,992	.51
Main edit--conflicts with another record	15,230	2.58
Total	263,156	44.66

Types and Frequencies of "Error" Conditions

The types and frequencies of error or reject conditions noted in 1969 editing are shown in table 1. Missing identification numbers for sires of grade cows led the list with 802,079; next in order was conflicting or questionable birth dates--appearing 17,188 times. The number of registered cows rejected because the missing dam or sire identification number was all zeros dropped from 6,548 in 1968 to 4,086 in 1969. The condition "Cow and dam breed unequal" in registered cows was more prevalent (3,131) in 1969 than in 1968 (1,868).

The inclusion of blanks in the record and alphabetics in the two high-order positions of the sire number rose markedly in 1969.

Care in identifying and reporting all animals in each herd will greatly reduce the records rejected and the work needed to correct such errors.

Table 2 gives the frequency of the various error conditions encountered in the May 1970 sire summary run.

You will note that tables 1 and 2 show error conditions rather than numbers of records in error. Records are edited for all remaining fields after the first conflict is found. Many records continue to contain more than one error. This is reflected in the fact that the number of error conditions in table 1 are more than the records shown on page 2 as rejected.

Importance of Complete and Accurate Records

The conditions that cause records to be rejected are explained in detail, beginning on page 15. Understanding why records are rejected may encourage dairymen, DHI supervisors, and others involved in the National Dairy Herd Improvement Program to provide more complete and accurate production records. This will make their own records more valuable and help to get more accurate genetic evaluations. Some processing centers are listing sire and dam identification on the monthly barn sheet so that these can be easily checked and corrected if necessary. In any event, a dairyman can check through his record book to insure correct reporting of cow, sire, and dam identification (including their respective breeds), correct birth and calving dates for the cow, and correct milk and fat production figures. Checking at the farm at the time the cow calves, during the lactation, and possibly when the lactation record is completed is less expensive and less frustrating than having to trace an error just at the time a record is needed for management, sale, or other purpose.

The information included in an Official DHI record submitted to USDA is shown in the formats on pages 9 and 10. Please note that there are positions available to code situations which, although not standard, have been validated as being correct, so that the lactations will not be rejected by USDA edits. More detailed information concerning record handling is given to dairy records processing centers.

Steps in Editing Records

The first step in editing records for sire and cow evaluation is the requirement that the records used be those of cows on Official DHI test. The USDA then edits the records for completeness and for consistency of information. Both preliminary and main edits are done on a computer. The preliminary edit eliminates records with error conditions that do not depend on comparison with other records for detection. These conditions are:

1. Missing data.
2. Blanks or invalid characters in any field of the record.
3. Alphabetic characters in fields that should be numeric.
4. More than 305 or less than 7 days in milk.
5. All zeros in month, day, or year of the calving date.
6. All zeros as number for sire, dam, or breed of registered cow.

7. All zeros as number or breed for registered cow.
8. Breed code "8" for a registered cow (unless "08" appears as the animal prefix code.
9. An eartag number for the sire of a registered cow.
10. Unequal breeds for a registered cow and her dam.
11. Unequal breeds for a registered cow and her sire.
12. All zeros as number for sire of grade cow. (These records are used for national breed and State breed averages.)
13. Unequal breed for grade cow and her sire if the cow is not coded as a crossbred, breed code "8," (unless the breed of cow is "1," "2," or "5," and the animal prefix code is "36" or "37" denoting identity enrollment status).
14. Grade cow coded as breed "8," but sire and dam's breed are equal and not breed "8." (Same exceptions as for 13.)
15. Grade cow has sire with breed "0."

A grade cow's record will not be rejected if the cow's dam's number is all zeros.

The main edit drops records that conflict in some way with other records in the master file or data in the herdbook of the dairy cattle registry organizations. Checks that are made in the main edit are:

1. Questionable calving date.
2. Conflicting data for the same calving date, or duplicate milk and fat yields for two different calving dates.
3. Less than 9-month interval between calving dates for two records of the same cow.
4. Production (milk, fat, or percent fat) out of range for breed and age.
5. Identification of registered cows is compared with herdbook data when they are available. Discrepancies in two or more fields (sire, dam, or birth date) between an individual record and the herdbook will cause the record to be rejected.
6. Registration numbers are checked for ranges depending on breed and age of cow when herdbook data is not available.

7. All remaining cows are compared against previously reported identification data.

   (a) Discrepancies between previously reported identification and current data cause both to be rejected unless they can be adjusted under provisions 7(b) or 7(c).
   (b) If the discrepancy is day of birth, the day of birth from the master record is put in the current record, and both are kept.
   (c) If either the current or master is a verified record, it is kept. If only one of the identification fields conflict, information from the verified record is transferred to the other, and both records are kept.

8. Cows with the same dam are checked for at least a 9-month interval between birth dates, and those with a shorter interval are rejected unless coded as twins. Uncoded twins are rejected in this category.

Automatic interval adjustment and reconciliation of inconsistencies is done by USDA in certain areas as follows:

1. Reconciliation of identification on grade cows is practiced when the conflicts arise from a "Z" vs. a zero, or "OOO" (alphabetic) vs. zeros in the three high-order positions of the number. All digits involved are converted to zeros for storage in master files.
2. One discrepancy between current identification and either herdbook or previously verified data are adjusted automatically.
3. When conflicts arise between the dam number of two records of the same grade cow, both are converted to zeros if the sire and birth dates are identical and non-zero.
4. When a current record contains an identification correction code, the sire, dam, and birth date from the current record are placed in all previous records for that cow in USDA master files.

Disposition of Records With Error Conditions

Figure 1 on page 28 is a Form 1060 showing records with various error conditions in print format as they are coded by USDA. The error tapes in print format are sent to the processing centers after each sire summary run. Each record is marked with error codes to explain the reason for rejection. As many as four codes can be listed.

How to Correct a Lactation Record

It is possible to have a lactation record corrected for future use in sire and cow evaluation. The simplest and most effective procedure for correcting a lactation record calls for: (1) submitting a deletion record card for each incorrect lactation record (the deletion record format and instructions for use are shown as figures 2 and 3 on p. 29 and 30); and (2) submitting the correct lactation record—preferably on tape—in the lactation record tape format (p.9) or on a card in the lactation record card format (p.10).

To delete a single record, the deletion-record data must be submitted in every detail exactly as the originally reported lactation record; i.e., the same cow, sire, and dam numbers, the same breed of each animal, the same birth date, and the same calving date. When more than one record for a cow is in error, all records may be dropped by using "999999" in the calving date positions.

Corrected lactation records must carry either an identification correction code or a production correction code (depending on the type of error) in positions 31 or 87, respectively, in the lactation record tape format (p.9) or in positions 31 or 75, respectively, in the lactation record card format (p.10).

USDA prefers to receive corrected records on tape through the dairy records processing centers. A dairyman, DHIA supervisor, or extension agent wishing to correct a record should send both original, incorrect data and correct data to his processing center. The center can accumulate these records and send them to USDA for the appropriate sire summary run.

The following format for lactation record tapes was adopted at the 1966 National DHIA Computing Center Workshop and replaces all previous lactation record tape formats.

Position	Fields[a]
1	Breed of cow
2 - 10	Cow number (registration or eartag)
11	Breed of sire
12 - 20	Sire number (registration or eartag)
21	Breed of dam
22 - 30	Dam number (registration or eartag)
31	Identification code (correction or verification)[b]
32 - 37	Year, month, and day of birth
38 - 43	Year, month, and day of calving
44 - 46	Days dry prior to this lactation[a][c]
47 - 49	Current days carried calf[a]
50 - 51	Days 3x (nearest 10)[a]
52 - 54	Days in milk
55 - 58	Milk (nearest 10 lb.)
59 - 62	Fat (lb.)
63	Termination code (replaces old C.A.R. code)[e]
64 - 66	Body weight (nearest 10 lb.)[a]
67 - 69	Concentrates (grain) fed (nearest 10 therms)[a]
70 - 73	Solids-not-fat (lb.)[a]
74 - 77	Protein (lb.)[a]
78	Type-of-testing code[i]
79 - 80	State code
81 - 82	County or association code
83 - 86	Herd code
87	Production correction code[j]
88 - 89	Lactation number[a]
90 - 93	Cow control (index) number
94 - 98	Zero
99 -100	Processing center code

The following format for lactation record cards was adopted at the 1966 National DHIA Computing Center Workshop and replaces all previous lactation record card formats.

Column	Fields[a]
1	Breed of cow
2 - 10	Cow number (registration or eartag)
11	Breed of sire
12 - 20	Sire number (registration or eartag)
21	Breed of dam
22 - 30	Dam number (registration or eartag)
31	Identification code (correction or verification)[b]
32 - 37	Year, month, and day of birth
38 - 43	Year, month, and day of calving
44	Days dry prior to this lactation (nearest 10)[a][d]
45	Current days carried calf (nearest 10)[a][d]
46	Days 3x (nearest 10)[a][d]
47 - 49	Days in milk
50 - 53	Milk (nearest 10 lb.)
54 - 57	Fat (lb.)
58	Termination code (replaces old C.A.R. code)[e]
59 - 60	Body weight (nearest 10 lb.)[a][f]
61 - 62	Concentrates (grain) fed (nearest 100 therms)[a]
63 - 65	Solids-not-fat or protein (lb.)[a][g][h]
66	Type-of-testing code[i]
67 - 68	State code
69 - 70	County or association code
71 - 74	Herd code
75	Production correction code[j]
76	Lactation number[a][k]
77 - 80	Cow control (index) number

Footnotes for Lactation Record Tape and Card Formats

a/ When information is not available, field must be filled with zeros rather than left blank. Use zeros also for records where only part of the concentrates fed was available.

b/ Codes for correction or verification of identification (identification is defined as cow number, sire and dam numbers, breed codes, and birth date):

Code	Definition
0	No correction or verification.
1	Identification in the record replaces any previously reported information for this cow (correction code). Note: This does not apply to a correction of cow number. This must be reported by direct correspondence between USDA and State Extension Dairymen or Processing Centers and on a special format card.
2	Identification is correct although somewhat unusual (verification code).
3	Cow is a twin (or triplet, etc.)
4	Cow has been previously reported under a different, but unknown eartag number (i.e., the cow has been retagged).
5	Grade cow not born in current herd; birth date estimated.
6	Combination of codes 1 and 3.
7	Combination of codes 2 and 3.

c/ No zone code will be shown in position 44. In the previous tape format, a "high" punch in position 44 was used to indicate the format type.

d/ Use "high" or "zone" punch in the high-order position of the field in addition to "tens" numeral when days equal or exceed 100 in the following manner:

(1) "11" punch if 100 - 190 days
(2) "12" punch if 200 or more days
Do not distinguish among values exceeding 290 days.

For example the following number of days should be coded as follows:

Original number of days	Coded value
54	5
55	6
98	$\overline{0}$
150	$\overline{5}$
220	$\overset{+}{2}$
290	$\overset{+}{9}$
320	$\overset{+}{9}$
500	$\overset{+}{9}$

e/ Termination codes (replace old C.A.R. codes):

Code	Definition
0	Normal lactation terminated by dry date or 305 days in lactation when cow is still in the herd.
1	Incomplete terminated record of at least one valid test followed by two or more consecutive missed tests or a period of more than 75 days between consecutive tests, but the cow remains in the herd. The record up to the missed test to be coded "1" and sent to USDA--project to 305 days. Note: The complete record of 305 days or less for a lactation that was terminated due to two consecutive missed tests or to having consecutive tests more than 75 days apart should be coded "9" and sent to USDA also. Some valid reasons for missed tests

are (1) broken, spilled, or accidentally missed samples; (2) cow goes on show circuit during lactation.

2 Sold for dairy purposes--project to 305 days.
3* Sold because of low production--project to 305 days.
4* Sold because of reproductive problems--project to 305 days.
5* Sold because of disease, injury or unspecified reasons--project to 305 days.
6* Died--project to 305 days.
7* Sold because of mastitis or other udder problem--project to 305 days.
8 Record ended by an abortion--project to 305 days.
9 Record not to be used for sire or cow evaluation. Note: Lactation initiated by abortion; complete record with two or more consecutive months missing where valid portion of record has previously been submitted to USDA as code 1; a record for which any two consecutive tests were more than 75 days apart; no test within 78 days of calving. (The number of days is changed from 60 in accordance with the Official DHI Rules, Revised and Accepted by the Coordinating Group, July 1969.)

*Centers unable to use codes 3 through 7 in the manner shown should code all these categories as code 3.

f/ Punch the high order 2 digits if body weight (bwt.) in 10's equals 3 digits. (e.g., 854 lb. = 85)

Use "high" or "zone" punch in the high-order position of the field in addition to the appropriate 2 digits if bwt. exceeds 994 as follows:

(1) "11" punch if 995 — 1,994 lb.
(e.g., 995 lb. = $\overline{0}0$
1,000 lb. = $\overline{0}0$
1,290 lb. = $\overline{2}9$
1,994 lb. = $\overline{9}9$

(2) "12" punch if 1,995 lb. or more
(e.g., 2,000 lb. = $\overset{+}{0}0$

g/ Use "high" or "zone" punch in the high-order position of the field in addition to low order digit, if field exceeds 999 as follows:

(1) "11" punch if 1,00$\underline{0}$ – 1,999 lb.
(e.g., 1,501 lb. = $\overline{5}01$
(2) "12" punch if 2,000 lb. or more solids-not-fat only (e.g., 2,110 lb. = $\overset{+}{1}10$

h/ Use "11" punch in column 65 when protein reported.

i/ "Type-of-testing" codes:

Code	Definition
0	Official DHI
1	Official DHIR
2	Bimonthly (unofficial)
3	Alternate AM/PM (unofficial)
4	Goats (Official DHI and DHIR, but not to be included with cattle records)
5	Other unofficial plans
6	Vo-Ag, FFA (unofficial)
7	O-S (unofficial)
$\overline{7}$	O-S, alternate AM/PM (unofficial)
8	WADAM (unofficial)
9	Trimonthly (unofficial)

j/ Production correction or verification codes:

Code	Definition
0	No correction or verification
1	Lactation data replace that previously reported for this cow and calving date (correction code).
2	Production data are correct, although unusual for breed and age (i.e., fat percent is unusally high or low, etc.)(verification code).

k/ Use "11" punch in column 76 if field exceeds 9.

Error Code Explanation

Relative frequency of the error conditions for 1969 are given in table 1 on page 31. The frequencies for the May 1970 sire summary run are given in table 2 on page 32. The following are the error codes with an explanation of each code:

A-type errors—conflicts with herdbook data from breed organizations or with other lactation records.

A1 Two or more identification fields (sire, dam, birth date) in this record conflicted with the herdbook of the respective breed registry organization. Note: For cases where only one field (sire, dam, or birth date) in a lactation record conflicts with the herdbook, the lactation record is changed to conform with the herdbook. Records that can be adjusted in this manner are not rejected.

A2 The record in question has been rejected because identification in it disagrees with identification previously verified as being correct by State Extension Dairymen or USDA.

A3 This condition is the same as A2 except that the verification was supplied by a DHI Computing Center.

A4 This error involves a conflict between the identification data (sire, dam, birth date) on two lactation records of a cow, where both lactation records have been previously verified by different sources as being correct. Note: Identification is considered verified when a "2" is reported in position 31 of the lactation tape record. Production is considered verified when a "2" is reported in position 87 of the tape record.

A5 Identification data on two or more lactation records of a cow conflicted. Note: In neither record was the data verified or marked with a correction code. Also included are conflictions between an incoming record and previously reported records in USDA master files.

This is one of the most frequent errors USDA encounters. Many times the error is really in cow number. What appears to be two conflicting records of one cow really should be records on two different cows.

B-type errors—questionable or invalid birth date.

B1 The year of birth in the record is higher than the year in which the record was received by USDA.

B2 The month of birth is either zero or greater than 12.

B3 The day of birth is either zero or greater than 31 for a registered cow.

B4 There is less than a 9-month interval between birth dates of two daughters of the same cow. Note: This error quite often involves cows which are actually twins, but where the twin code was not shown in the lactation record as it was reported from the computing center. Records of twins that are coded with a "3" in position 31 of the lactation record will not be rejected by this edit step.

Another common situation is that one of the dam numbers is wrong. This condition usually applies only to grade animals since the authenticity of registered information is checked against the herdbook data when they are available.

C-type errors—questionable or invalid cow identification number.

C1 This cow's registration number is out of range for the breed reported. Note: Each cow registration number is automatically checked against a high and low number appropriate to the breed involved. The low number is chosen sufficiently small to screen out only the most obvious reporting errors. The high number is normally the highest one issued by the breed to the present date. USDA experience has indicated that in many cases the real problem involved is that the breed codes listed for the cow are incorrect. This check was included to avoid putting registered cows in the wrong breed.

C2 This cow's record has an invalid "new series" eartag number. Note: For all cows born on or after January 1, 1957, the eartag number must include nine positions with only numerals in the four low-order positions. The prefix code is in the two high-order positions and any alphabetics must be in the three remaining positions.

C3 This cow's record has an invalid "old series" eartag. Note: Several eartag variations were used for cows prior to 1957. However, certain conditions were not permissible. Only very old cows will be involved.

C4 This registered Brown Swiss or Red Poll cow is coded as a foreign animal ("01" in high-order positions of cow registration number). Note: There are no Canadian registry associations for these breeds, and no importations from other countries are allowed at present.

C5 This cow has an invalid American Dairy Cattle Club registration number

D-type errors—questionable or invalid dam number

D1 The dam number is out of the permissible range as a registration number for the breed reported. Note: Each registered dam identification number is compared against high and low numbers appropriate to the breed involved. Among those rejected in this category are numeric private dam numbers of grade cows, which are usually only one to four positions in length. This happens because there are no alphabetics in the number, therefore, the computer program considers and compares it as a registration number. (All eartags must have alphabetics in them.)

Also rejected in this category are eartag numbers that do not have a valid prefix code in the two high-order positions. This is one of the major problems in reporting dam numbers.

D2 This registered cow's record was reported with either a zero or grade dam number.

D3 The registration number of the dam is higher than the cow's registration number and there is no verification code present in the record. Note: In a very few cases this is a valid situation. However, these must be identified with a verification code ("2") in position 31 of the lactation record.

D4 The eartag number of the dam is invalid. See C2 and C3.

D5 This registered Brown Swiss or Red Poll cow has a dam coded as a foreign registration number. See C4.

D6 This registered Milking Shorthorn cow has an invalid dam registration number.

D7 The dam has an invalid American Dairy Cattle Club registration number.

E-type errors—questionable or invalid breed code designation

E1 This registered cow's breed does not agree with that of her sire or dam. This applies only if the cow's breed is not a "1," "2," or "5" followed by a "36" or "37" as the animal prefix code.

E2 This registered cow, sire, or dam has been designated breed "8," which is the designation for crossbreds or unknown breed. This does not apply when the cow has been coded breed "1," "2," or "5" with "36" or "37" as the animal prefix code. Note: If there is an "08" as the animal prefix code, a record is not rejected. This coding is used to identify registered cows of the Red and White breed.

E3 The sire or dam identification number has been reported with a zero breed code. Note: A record cannot be used by USDA unless there are valid breed codes for the identification data reported.

F-type errors—questionable or invalid calving date

F1 The calving date recorded is later than the date the record was received by USDA.

F2 The month of calving was coded as zero or greater than 12.

F3 The day of calving (registered cows only) had been coded zero, or the day of calving has been coded as greater than 31 (for any cow).

F4 The age at calving calculated from the reported calving and birth dates is less than 14 months. Note: It is possible that the error involved in this record is the birth date. If the record is valid it should be marked with a verification code ("2" in position 31).

F5 Two records of a cow have been reported with calving dates that are less than 9 months apart. Note: In many of these the real problem is in some other area besides calving date. In many the real error is that two cows have been reported with the same eartag or registration number. Another segment of the errors that fall in this class result from a record that was started with an abortion, but was reported without the proper termination code. Also, the previous record was not reported as being terminated by an abortion. Thus, the calving dates may be correct, but there is still something wrong with these records.

F6 Two records for a cow have been reported with identical calving dates but with different amounts of milk or fat. Note: One apparent source of this error is the reporting of corrected production data without a production correction code of "1" in position 87 of the lactation record. We have also found that many of the differences in production are quite minor. This would appear to be minor systems problems in the dairy records processing centers caused by a second 305-day record at some later date.

However, there is only one production amount that is proper for a lactation of a given cow. Thus, USDA will not use any conflicting records on production until the correct one is identified.

F7 Two lactations of a cow have equal production but different calving dates. Note: It is possible that these lactation records are correct, but our studies indicate that in most cases something is wrong. If the records are correct, verify both records "2" in position 87 and return to USDA.

F8 The calving date plus the days in milk extends past the date the record was received by USDA.

F9 More than 20 lactation records have been reported for this cow. Note: This might be possible, but all situations found so far by USDA have included some type of error. This may be in any area but most likely there is more than one cow involved, and one is improperly coded.

G-type errors—questionable or invalid prefix code in an eartag identification number

G1 The eartag number of the cow contains an illegal prefix code.

G2 The sire's eartag number contains an illegal prefix code.

G3 The dam's eartag number contains an illegal prefix code.

Valid prefix codes are in several categories:

For registered animals, they are:

00 = Animal registered in primary American herdbook for each breed.
01 = Canadian or Channel Islands registration numbers.
08 = "Red and White" cattle.
17 = Goats (registered or eartag)
30 = Red and White Holsteins registered with the Holstein-Friesian Association of America.
36 = Cows in an identity enrollment program whose offspring are not eligible for inclusion in the regular herdbook.
37 = Cows in an identity enrollment program whose offspring are eligible for inclusion in the herdbook (if they meet requirements).

99 = American Dairy Cattle registrations.

For grade animals, they are:

02 = Canadian Eartag
11 = Maine
12 = New Hampshire

13 = Vermont
14 = Massachusetts
15 = Rhode Island

16 = Connecticut
21 = New York
22 = New Jersey

23 = Pennsylvania
31 = Ohio
32 = Indiana

33 = Illinois
34 = Michigan
35 = Wisconsin

41 = Minnesota
42 = Iowa
43 = Missouri

45 = North Dakota
46 = South Dakota
47 = Nebraska

48 = Kansas
50 = Delaware
51 = Maryland

52 = Virginia
54 = West Virginia

55 = North Carolina
56 = South Carolina
57 = Georgia

58 = Florida
61 = Kentucky
63 = Tennessee

64 = Alabama
65 = Mississippi
71 = Arkansas

72 = Louisiana
73 = Oklahoma
74 = Texas

81 = Montana
82 = Idaho
83 = Wyoming

84 = Colorado
85 = New Mexico
86 = Arizona

87 = Utah
88 = Nevada
91 = Washington

92 = Oregon
93 = California
94 = Puerto Rico

95 = Hawaii
96 = Alaska

For foreign animals other than Canadian or Channel Island (registered or grades), they are:

09 = El Salvador
24 = Argentina
25 = Brazil
27 = Bolivia,
Paraguay

67 = Costa Rica
69 = Guatemala,
Honduras,
Nicaragua, and
Panama

28 = Chile
29 = Uruguay
59 = Caribbean Islands
66 = Mexico
75 = Colombia
76 = Ecuador
77 = Peru
78 = Venezuela
79 = Guyana

I-type errors—non-numeric characters in numeric fields of the record. These errors usually originate in computing centers.

I1 One or more registration numbers in the pedigree contains blank or alphabetic characters.
I2 The cow's birth date contains blank or alphabetic characters.
I3 The lactation information (including the herd code) contains blank or alphabetic characters.

J-type errors—the same identification number appears for two or more animals in the pedigree

J Cow and sire numbers equal, cow and dam numbers equal, or sire and dam numbers equal.

L-type errors—days milked three times a day exceeds total days in milk reported.

L Days milked three times a day exceeds total days in milk reported.

M-type errors—questionable milk production

M1 The 2x-305-day-ME milk production in each record is checked against high and low limits for each breed. If the production falls outside this range, the record is rejected. The appropriate breed limits which are about 10 percent above the existing breed class leaders on the high end, are listed as follows:

Breed		Milk		
		Low		High
		2-yr	36 months or older	
Code	Name	Lb.	Lb.	Lb.
1	Ayrshire	1,500	3,000	34,100
2	Guernsey	1,500	2,400	29,700
3	Holstein	2,000	4,600	42,900
4	Jersey	1,500	2,400	27,500
5	Brown Swiss	1,500	3,000	24,100
6	M.Shorthorn	1,500	2,400	33,000
7	Red Dane	1,500	3,000	33,000
8	Mixed Breed	1,500	2,400	41,250
9	Red Poll	1,500	2,400	33,000

M2 The actual milk production, on a pounds-per-day-milked basis, is checked against high and low limits for each breed as follows:

Breed		Milk			
		2-yr		36 months or older	
		Low	High	Low	High
Code	Name	Lb.	Lb.	Lb.	Lb.
1	Ayrshire	5	87	10	121
2	Guernsey	5	87	8	110
3	Holstein	10	110	15	160
4	Jersey	5	83	8	105
5	Brown Swiss	5	88	10	121
6	M.Shorthorn	5	77	8	118
7	Red Dane	5	77	10	118
8	Mixed Breed	5	106	8	149
9	Red Poll	5	77	8	118

M3 The milk production value was not reported.

N-type errors—number of days milked was less than 7 or more than 305

N Number of days milked was less than 7 or more than 305.

0-type errors—questionable fat production

01 The fat production reported (2x-305-day-ME) is outside the acceptable range for the breed as listed in the following tabulation:

Breed		Fat		
		Low		High
		2-yr	36 months or older	
Code	Name	Lb.	Lb.	Lb.
1	Ayrshire	61	91	1,485
2	Guernsey	61	91	1,320
3	Holstein	91	122	1,980
4	Jersey	61	91	1,540
5	Brown Swiss	61	91	1,650
6	M. Shorthorn	61	91	1,595
7	Red Dane	61	91	1,595
8	Mixed Breed	61	91	1,870
9	Red Poll	61	91	1,595

02 The actual fat production, on a pounds-per-day-milked basis, is checked against high and low limits for each breed as follows:

Breed		Fat			
		2-yr		36 months or older	
		Low	High	Low	High
Code	Name	Lb.	Lb.	Lb.	Lb.
1	Ayrshire	0.2	3.5	0.3	5.3
2	Guernsey	.2	3.9	.3	5.5
3	Holstein	.3	4.3	.4	6.8
4	Jersey	.2	4.0	.3	5.5
5	Brown Swiss	.2	3.5	.3	5.8
6	M. Shorthorn	.2	3.3	.3	5.8
7	Red Dane	.2	3.3	.3	5.8
8	Mixed Breed	.2	4.3	.3	6.8
9	Red Poll	.2	3.3	.3	5.8

03 The fat production value was not reported.

P-type errors—questionable or invalid fat percent. Fat percent for editing purposes is computed from actual reported milk and fat yields.

P1 This unverified incomplete record has a fat percent less than 2.4% or greater than 7.3%.

P2 The unverified fat percent for a complete record for a cow identified by breed is out of the acceptable range as follows:

Breed		Percent Fat	
		Low	High
Code	Name	Pct.	Pct.
1	Ayrshire	2.8	6.0
2	Guernsey	3.4	6.7
3	Holstein	2.4	5.5
4	Jersey	3.4	7.3
5	Brown Swiss	2.8	6.0
6	M. Shorthorn	2.8	5.9
7	Red Dane	2.8	6.0
8	Mixed Breed	2.4	7.3
9	Red Poll	3.0	6.0

Records with a production verification code or incomplete records of all breeds are checked against the following limits:

	Low limit	High limit
Production verification code "2" in column 87 ----------------------------	2.0	9.9
Incomplete records of all breeds --------	2.4	7.3

Note: Many fat percentages outside of the ranges listed above will not be rejected if they have a production verification code in the lactation record as it is submitted. We realize that some of the records that are rejected under the "P" category are valid records.

S-type errors—questionable or invalid sire identification number. The sire identification number error represents one of the major categories of errors that we find.

- S1 The registration number of the sire is out of range for the breed involved. Note: This usually involves an invalid number of some type. Digits are missing or an improper eartag number was used. For instance, the prefix code may be left off of an eartag number.
- S2 This registered cow has been reported with an eartag sire number.
- S3 The eartag number of the sire of a grade cow is invalid. See C2 and C3.
- S4 This registered Brown Swiss or Red Poll sire has been coded with a foreign designation. See C4.
- S5 This registered Milking Shorthorn sire number is invalid.
- S6 This registered American Dairy Cattle Club sire number is invalid.

ERRATUM: In the Dairy-Herd-Improvement Letter, ARS 44-221, August-November 1970, on page 9, table I-2, the last line caption in the stub should read Total records projected.

DHI COPY OF STATE ERROR LIST

DATE 69-09

HERD CODE	COW NUMBER	COW BR.	SIRE NUMBER	SIRE BR	DAM NUMBER	DAM BR.	DATE OF BIRTH MO	DATE OF BIRTH DAY	DATE OF BIRTH YR.	DATE FRESH MO.	DATE FRESH DAY	DATE FRESH YR.	NUMBER DAYS DRY	NUMBER DAYS C.C.	NUMBER DAYS 3X	NUMBER DAYS IN MILK	MILK 10 LB.	% TEST	FAT LB.	C.A.R.	BD. CWT.	ERROR CODES XXX XXX	ERROR CODES XXXX XXXX	ERROR CODES XX XXXX XX	ERROR CODES XX XX X	ERROR CODES XX XX	ERROR CODES XX H.T. XX	MISC. CODES	COW CONTROL
47029007	006187757	3	001443590	3	005679736	3	*08	*26	*64	12	02	67	00	06	00	142	0467	3.2	0149	C	000			B4					13
47029007	006823536	3	010273711	3	*010113935	3	07	16	65	06	01	68	00	23	00	305	1313	3.5	0460	0	117			01					232
47130008																													
47130008	005949671	3	001426368	3	004067851	3	07	01	63	*05	*06	*68	03	06	*00	305	*0855	3.8	*0329	0	150			F6				1	111
47610049	005949671	3	001426368	3	004067851	3	07	01	63	*05	*06	*68	03	06	*00	305	*0856	3.9	*0330	0	150			F6				1	43
47200068																													
47200068	005653014	3	001371358	3	*001033534	3	08	02	62	09	26	68	07	10	00	182	0642	3.7	0236	C	150			01					30
47200068	006007391	3	001395429	3	*001395722	3	06	22	63	09	17	68	07	03	00	191	*0226		0086	C	150			01 M2					14
47209009																													
	000481570	5	000122548	5	000442454	5	06	08	65						PREVIOUS REPORT														
47209069	000481570	5	000122548	5	000442454	5	*10	*21	*64	06	09	68	03	06	00	108	0504	4.1	0208	B	140			A5					53
47210008																													
47210008	000440614	5	000134102	5	000336796	5	*04	*22	*62	07	23	68	00	10	00	305	0844	4.0	0336	0	000			B4					61
47210008	000443175	5	000134102	5	000336796	5	*07	*05	*62	06	26	68	00	00	00	305	0834	3.5	0294	0	000			B4					54
47270032																													
47270032	002320726	2	000527578	2	001573954	2	*09	*19	*63	08	11	68	00	22	00	300	0761	6.1	0468	0	000			B4					82
47270032	002320727	2	000527578	2	001573954	2	*09	*19	*63	12	21	67	00	00	00	305	0927	5.3	0495	0	000			B4					79
47280105																													
47280105	006297967	3	001235750	3	005218276	3	01	05	65	*09	*30	*67	00	00	00	144	0302	3.7	0111	0	000			F5					158
472801C5	006297967	3	001235750	3	005218276	3	01	05	65	*05	*10	*68	00	11	00	305	1388	3.4	0472	0	000			F5					158
47280105	006382928	3	001244845	3	005884305	3	05	16	65	*05	*08	*68	00	00	*00	305	*1780	3.5	*0623	0	130			F6					
351401C5	006382928	3	001244845	3	005884305	3	05	16	65	*05	*05	*68	00	00	*00	305	*1755	3.5	*0606	0	000			F6					
47289058																													
47289058	006272149	3	001287090	3	005386783	3	*01	*05	*65	09	17	67	00	21	00	305	1228	3.9	0484	0	000			B4					268
47289058	006272150	3	001287090	3	005386783	3	*01	*05	*65	06	01	68	00	06	00	175	0838	3.8	0321	C	000			B4					283
47289058	47WAC3365	3	*004468912	3	*001173577	3	09	05	63	02	05	69	07	00	00	129	0559	3.6	0199	C	150			S1 D1					231
47289075																													
47289075	006633672	3	001473511	3	005588018	3	02	03	66	*08	*31	*68	00	00	00	291	0896	4.8	0434	0	125			F5					76
47020005	006633672	3	001473511	3	005588018	3	02	03	66	*05	*12	*68	00	00	00	099	0442	3.3	0144	B	103			F5					151
47289097																													

DHIA - 1060 (2-58)

DABBS INC., DEEP RIVER, CONN.

RECORD DELETION FORMAT *(Card)*

(For Deleting One Lactation Record or All Records for a Cow from USDA Master Files)

Read instructions on reverse before coding data

CALVING CONTROL DATE *(Cols. 38 - 43)*
DELETE A SINGLE LACTATION, record actual calving date
DELETE ALL RECORDS, record 999999

COW		SIRE		DAM			BIRTH DATE			CALVING CONTROL DATE				
BREED	NUMBER	BREED	NUMBER	BREED	NUMBER	ID CODE	YR.	MO.	DAY	YR.	MO.	DAY	TYPE	REC. CODE
1	*2 - 10*	*11*	*12 - 20*	*21*	*22 - 30*	*31*	*32 - 37*			*38 - 43*			*58*	*80*
						0							K	E
						0							K	E
						0							K	E
						0							K	E
						0							K	E
						0							K	E
						0							K	E
						0							K	E
						0							K	E
						0							K	E
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						0							K	E
						0							K	E
						0							K	E
						0							K	E
						0							K	E
						0							K	E
1	*2 - 10*	*11*	*12 - 20*	*21*	*22 - 30*	*31*	*32 - 37*			*38 - 43*			*58*	*80*

AH FORM 59 (FEB. 1969)

(Over)

USDA - ARS

INSTRUCTIONS FOR AH FORM 59 - RECORD DELETION FORMAT (Card)

(For Deleting One Lactation Record or All Records for a Cow from USDA Master Files)

IF PUNCHED CARDS ARE SUBMITTED: (1) **ALL** columns **NOT** designated in the following instructions **MUST** be left blank; (2) the "ID Code" in column 31 is zero "0"; (3) the "Type Code" in column 58 is "K" *(11 (-) and 2 punches)*; and (4) the "Record Code" in column 80 is "E" *(12 (+) and 5 punches).*

COMPLETE IDENTIFICATION INFORMATION MUST BE GIVEN

CARD COLUMNS	EXPLANATION OF DATA
1	Cow's breed should be expressed in one of the following codes: Ayrshire ...1 Guernsey...2 Holstein...3 Jersey.....4 Brown Swiss ...5 M. Shorthorn....6 Red Dane....................7 Other breeds or crossbreds ....8 Red Polled . . . 9
2 - 10	Cow number *(registration or eartag)*
11 -	Sire's breed *(Use breed codes above)*
12 - 20	Sire number *(registration or eartag)*
21	Dam's breed *(Use breed codes above)*
22 - 30	Dam number *(registration or eartag)*
31	ID code *(zero)* already entered
32 - 37	Birth date *(year - month - day)*
38 - 43	Calving control date: **DELETE A SINGLE LACTATION,** record actual calving date **DELETE ALL RECORDS,** record 999999
58	Type - K *(already entered)*
80	Record code - E *(already entered)*

TABLE 1.--Relative frequency of error conditions in Official DHI lactation records submitted for edit in 1969[1]

Main edit rejects[2]	Preliminary edit -by registered and grade cows	Error conditions	Error conditions in category	Percentage of total error conditions	Percentage of all records submitted
Code			Number	Percent	Percent
	Grade	Sire number all zeros	802,079	91.20	42.89
B		Conflicting or questionable birth date	17,188	1.95	.92
A		Conflict with previous information supplied	14,920	1.70	.80
F		Conflicting or questionable calving date	11,045	1.26	.59
S		Conflicting or questionable sire number	4,699	.53	.25
D		Conflicting or questionable dam number	4,114	.47	.22
C		Conflicting or questionable cow number	3,575	.41	.19
	Registered	Cow and dam breed unequal	3,131	.36	.17
	Regist./Grade	Blanks in any position of record	2,868	.33	.15
	Regist./Grade	Alpha in high-order 2 positions of sire number	2,437	.28	.13
	Registered	Dam number all zeros	2,239	.25	.12
	Regist./Grade	Sire breed zero	2,009	.23	.11
	Registered	Sire number all zeros	1,847	.21	.10
	Registered	Cow and sire breed unequal	1,558	.18	.08
	Regist./Grade	Dam breed zero	1,395	.16	.07
	Registered	Cow breed "eight"	642	.07	.03
J		Equal identification number for two or more of the animals in the pedigree	565	.06	.03
	Registered	Cow number all zeros	493	.06	.03
G		Invalid State code	458	.05	.02
	Grade	Eartag cow breed "non-eight," sire breed unequal	425	.05	.02
	Regist./Grade	Days in milk zero	212	.02	.01
	Registered	Cow number alphabetic	188	.02	.01
	Grade	Eartag cow breed "eight," "non-eight" sire and dam equal	188	.02	.01
I		Invalid characters - usually blanks or alphabetics	168	.02	.01
	Registered	Sire number alphabetic	164	.02	.01
	Registered	Cow breed zero	160	.02	.01
	Registered	Dam number alphabetic	141	.02	.01
E		Conflicting or questionable breed code	104	.01	.01
M		Conflicting or questionable milk pounds	94	.01	.01
	Registered	Sire number an eartag number	79	.01	.004
O		Conflicting or questionable fat pounds	68	.01	.004
P		Conflicting or questionable percent fat	62	.01	.003
	Regist./Grade	Alpha in high-order 2 positions of dam number	57	.01	.003
	Regist./Grade	Alpha in high-order 2 positions of cow number	53	.01	.003
N		Conflicting or questionable days in milk	7	.001	.0004
	Regist./Grade	Alpha "J" through "Z" in "Termination" code	7	.001	.0004
	Regist./Grade	Blank days in milk	3	.0003	.0002
	Registered	Blank cow breed	1	.0001	.0001
Total error conditions			879,443	100.00	47.02

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[1] Total lactation records submitted = 1,870,276; total lactation records rejected = 869,904; percentage lost = 46.5.

[2] Conditions using this code were discovered in the main edit and were recorded on the error tapes returned to the processing centers. All others were discovered in the preliminary edit.

TABLE 2.--Relative frequency of error conditions in Official DHI lactation records submitted for edit in May 1970[1]

Main edit rejects[2]	Preliminary edit -by registered and grade cows	Error conditions	Error conditions in category	Percentage of total error conditions	Percentage of all records submitted
Code			Number	Percent	Percent
	Grade	Sire number all zeros	244,934	92.33	41.57
B		Conflicting or questionable birth date	5,562	2.10	.94
A		Conflict with previous information supplied	4,301	1.62	.73
F		Conflicting or questionable calving date	2,254	.85	.38
S		Conflicting or questionable sire number	1,263	.48	.21
D		Conflicting or questionable dam number	1,128	.43	.19
C		Conflicting or questionable cow number	780	.29	.13
	Regist./Grade	Sire breed zero	738	.28	.13
	Registered	Dam number all zeros	659	.25	.11
	Registered	Cow and dam breed unequal	635	.24	.11
	Registered	Cow and sire breed unequal	557	.21	.09
	Registered	Sire number all zeros	476	.18	.08
	Regist./Grade	Dam breed zero	344	.13	.06
I		Invalid characters - usually blanks or alphabetics	237	.09	.04
	Registered	Cow breed "eight"	185	.07	.03
	Regist./Grade	Blanks in any position of record	182	.07	.03
J		Equal identification number for two or more of the animals in the pedigree	166	.06	.03
	Grade	Eartag cow breed "non-eight," sire breed unequal	153	.06	.03
	Registered	Cow number all zeros	134	.05	.02
	Grade	Eartag cow breed "eight," "non-eight" sire and dam equal	74	.03	.01
	Registered	Cow number alphabetics	73	.03	.01
	Regist./Grade	Alpha in high-order 2 positions of sire number	56	.02	.01
	Registered	Cow breed zero	50	.02	.01
	Registered	Sire number alphabetics	45	.02	.01
	Registered	Dam number alphabetics	44	.02	.01
	Regist./Grade	Alpha in high-order 2 positions of dam number	42	.02	.01
G		Invalid State code	32	.01	.01
M		Conflicting or questionable milk pounds	32	.01	.01
E		Conflicting or questionable breed code	25	.01	.004
O		Conflicting or questionable fat pounds	25	.01	.004
	Regist./Grade	Days in milk zero	24	.01	.004
	Registered	Sire number an eartag number	21	.01	.004
	Regist./Grade	Alpha in high-order 2 positions of cow number	17	.01	.003
P		Conflicting or questionable percent fat	15	.01	.003
N		Conflicting or questionable days in milk	4	.002	.001
	Regist./Grade	Alpha "J" through "Z" in "Termination" code	1	.0004	.0002
	Registered	Blank days in milk	1	.0004	.0002
Total error conditions			265,269	100.00	45.02

[1] Total lactation records submitted = 589,277; total lactation records rejected = 263,156; percentage lost = 44.7.

[2] Conditions using this code were discovered in the main edit and were recorded on the error tapes returned to the processing centers. All others were discovered in the preliminary edit.

BOUND BY
HNM

UNIVERSITY OF ILLINOIS-URBANA
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